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Remedial Investigation

Volume I of II
Text, Tables, and Figures

for

Old Fire Fighting Training Area
Naval Station Newport
Newport, Rhode Island

Engineering Field Activity Northeast
Naval Facilities Engineering Command

Contract Number N62472-90-D-1298
Contract Task Order 0282

July 2001

TETRA TECH NUS, INC.

W5200234F

REMEDIAL INVESTIGATION

FOR

OLD FIRE FIGHTING TRAINING AREA
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION - NAVY (CLEAN) CONTRACT

Submitted to:
U.S Naval Facilities Engineering Command
Engineering Field Activity Northeast
Environmental Contracts Branch
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Contract Number N62472-90-D-1298
Contract Task Order 0282

July 2001

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APPENDICES

LIST OF ACRONYMS

AAL	Rhode Island Ambient Air Limit
ACOE	U.S. Army Corps of Engineers
ARAR	Applicable or Relevant and Appropriate Requirement
AVS	Acid Volatile Sulfides
AWQC	Ambient Water Quality Criteria
B&RE	Brown & Root Environmental
BLRA	Baseline Risk Assessment
CAD	Contained Aquatic Disposal
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
COPC	Chemical of Potential Concern
CTE	Central Tendency Exposure
EFA Northeast	Engineering Field Activity Northeast
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Marine Ecological Risk Assessment
ER-L	Effects Range-Low: NOAA Adverse Effects Benchmark Value For Sediment
ER-M	Effects Range-Median: NOAA Adverse Effects Benchmark Value For Sediment
FFA	Federal Facilities Interagency Agreement
FS	Feasibility Study
FWENC	Foster Wheeler Environmental Corporation
GRA	General Response Action
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IAS	Initial Assessment Study
ICR	Integrated Cancer Risk
IEUBK	Integrated Exposure and Uptake Biokinetic Model
IRP	Installation Restoration Program
IU/BK	Integrated Uptake/Biokinetic Model
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
mg/l	milligram per liter
MLW	Mean Low Water Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

LIST OF ACRONYMS (Continued)

NETC	Naval Education and Training Center
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NORTHDIV	Northern Division
NPL	National Priorities List
NS	Nearshore
O&M	Operation and Maintenance
OS	Offshore
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDI	Pre-Design Investigation
POTW	Publicly-Owned Treatment Works
PPE	Personnel Protective Equipment
PRG	Preliminary Remedial Goal
RAB	Restoration Advisory Board
RAG	Risk Assessment Guidance
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	Reference Dose
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SAIC	Science Applications International Corporation
SARA	Superfund Amendment and Reauthorization Act
SEM	Simultaneously Extracted Metals
SER	Shore Establishment Realignment Program
SF	Slope Factor
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List

LIST OF ACRONYMS (Continued)

TBC	To Be Considered Guidance
TCL	Target Compound List
TCLP	Toxic Characteristic Leaching Procedure
TCR	Tissue Concentration Ratio
TEV-HQ	Threshold Effects Value - Hazard Quotient
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRC	TRC Environmental Corporation
TSDF	Treatment, Storage, and Disposal Facility
TSS	Total Suspended Solids
TWA	Time-Weighted Average Concentration
μg/dl	microgram per deciliter
μg/kg	microgram per kilogram
μg/L	microgram per liter
URI	University of Rhode Island
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

OVERVIEW

This Remedial Investigation (RI) reports the activities, findings, and conclusions for investigations conducted at the Old Fire Fighting Training Area at Naval Station Newport in Newport, Rhode Island. These investigations were carried out to determine the nature and extent of contamination in site media, determine the fate and transport of contaminants in site media, and determine the risks posed by site contaminants to humans and the environment

SITE DESCRIPTION AND HISTORY

The 5.5-acre OFFTA site is located at the northern end of Coasters Harbor Island, surrounded by Narragansett Bay and Coasters Harbor located to the north to northwest and the east to northeast of the site, respectively.. The site contains a picnic area, playground, and baseball field and a one-story concrete block building (Building 144), all not currently in use. A chain link fence restricts access to the site. Unique topographic features at the site include two soil mounds: one that is approximately 20 feet high located in the center of the site, and another that is approximately 6 feet high located on the western side of the site. The rest of the site is generally flat, with surface elevations ranging from 8 to 12 feet above MLW. The site is mostly vegetated with grass.

A Navy fire fighting training facility occupied the site from World War II until 1972. During the training operations, sailors ignited fuel oils in various structures at the site that simulated shipboard compartments, and then extinguished the fires. Upon closure of the fire fighting training facility in 1972, the training structures were reportedly demolished and buried in two mounds on the site, then the entire area was covered with topsoil. The site was then converted to a recreational area (Katy Field) in 1976 and used as a recreational area until its closure in 1998. In May 1998 the EPA requested review of soil data from Katy Field because of EPA's concern of more intensive use of the area. After review of all the data collected (over 100 surface soil samples) it was determined that contaminants in surface soil do not present a risk to adults or children who played daily at Katy Field. The Navy decided to keep the site closed until all investigations under CERCLA had been competed. In its 22 years of use as recreation area, the site was used for organized activities including youth day camps, picnic functions, and little league baseball (1 year only), as well as for general recreation. A child day care center operated out of Building 144 on the site from approximately 1983 through January 1994 when it was relocated off-site to a larger facility on base.

STUDY AREA INVESTIGATIONS

This report is based on the various investigations conducted for the OFFTA site since 1990. Phase I and Phase II remedial investigations for the site were conducted in the early 1990s. Based on the findings of these investigations and regulatory review it was determined that the RI report could not be finalized until additional offshore ecological characterization was completed and the results integrated into a revised Draft Final RI Report.

The offshore ecological investigations were conducted in 1998 and a Marine Ecological Risk Assessment (ERA) for the site was completed in April 2000. Additionally, three supplemental investigations were conducted between 1997 and 2000: a Source Removal Evaluation, a Phase III RI and Human Health Risk Assessment for Recreational Use of the site, and a Background Soil Investigation. The findings of these investigations are incorporated into this RI.

GEOLOGY AND HYDROGEOLOGY

The site is underlain by the following materials: fill, consisting of construction debris and sand and gravel; silty sand and gravel; sand and gravel; peat and silt layer; and glacial till consisting of silt sand and gravel. Overburden deposit thickness range from about 6 to 27 feet thick, excluding the elevated mound areas located on the site.

In general, groundwater flows north to northwest toward Narragansett Bay and east to northeast toward Coasters Harbor. The groundwater migrates at the site at an estimated rate of between 145 feet per year and 1,131 feet per year. Depth to groundwater ranges from 4 to 9 feet below ground surface. Tidal influence is felt along the shoreline in both the overburden and bedrock aquifers but this influence does not extent beyond the shoreline. Both upward and downward vertical gradients were observed.

NATURE AND EXTENT OF CONTAMINATION

Results of the investigations indicated that site activities have resulted in the release of both organic and inorganic contaminants. A summary of the nature and extent of site contamination follows.

A few volatile organic compounds (VOCs) were detected in surface soils, subsurface soils, shoreline sediments, and groundwater at low concentrations below RIDEM residential soil criteria.

Semi-volatile organic compounds (SVOCs) were detected in all media across the site. The most prevalent detected SVOCs were polycyclic aromatic hydrocarbons (PAHs). PAHs were detected at their highest concentrations in surface and subsurface soil and groundwater sample locations adjacent to

Coasters Harbor. PAHs were also detected in all shoreline sediment locations, marine sediment stations, and storm water samples. The highest concentrations in marine sediment were detected at sampling stations nearest the shore in the vicinity of the central portion of the site. Concentrations of PAHs in surface soils, subsurface soils, and shoreline sediments exceeded RIDEM Residential Direct Exposure Criteria for soils. Other SVOCs, other than PAHs, were detected infrequently and in low concentrations in surface soils, subsurface soils, groundwater, and storm water. None of these exceeded RIDEM Residential Direct Exposure Criteria for soils.

Pesticides were detected in surface soils and subsurface soils across the site, in storm water, marine sediments, and in biota samples. Only one pesticide, endrin, was detected in groundwater. All pesticide concentrations were low.

PCBs were detected infrequently in surface and subsurface soils. All concentrations were detected below RIDEM Residential Direct Exposure Criteria for soils.

Metals were detected throughout the site. Many are the result of natural breakdown of soils and the parent bedrock and are naturally occurring in low concentrations. Concentrations of metals in site soils and groundwater were compared to site-specific background or upgradient samples. In general, metals were detected in higher concentrations on-site. In surface soils the metals detected most frequently at concentrations greater than background were arsenic, magnesium, and potassium. Arsenic, beryllium, lead and manganese in surface soils exceeded the RIDEM Residential Direct Exposure Criteria for soils. The highest concentrations of arsenic were detected in surface soils from the central portion of the site. In subsurface soils the metals detected most frequently at concentrations greater than background were barium, calcium, copper, lead, potassium, and zinc. Arsenic, antimony, beryllium, lead and manganese in subsurface soils exceeded the RIDEM Residential Direct Exposure Criteria for soils. The highest concentrations of arsenic were detected in subsurface soils from the central portion of the site.

Concentrations of metals in site groundwater were compared to upgradient samples. In groundwater the metals detected most frequently at concentrations greater than upgradient groundwater samples were calcium, iron, magnesium, potassium, and sodium. The highest concentrations of metals were detected in samples from the north and central portions of the site. Nickel and copper concentrations in storm water samples exceeded marine ambient water quality criteria (AWQC).

Metal concentrations detected in shoreline sediments were comparable to surface soil samples. Arsenic, beryllium, lead and manganese in shoreline sediments exceeded the RIDEM Residential Direct Exposure Criteria for soils. No spatial pattern was evident in marine sediment sample metal concentrations.

All surface soil samples analyzed for dioxins detected low dioxin concentrations well below the accepted dioxin residential clean-up goal of 1ppb.

Total petroleum hydrocarbons (TPHs) were detected in subsurface soils throughout the site. Detected TPH concentrations exceed the RIDEM Residential Direct Exposure Criteria for soils at depths of 3-11 feet below ground surface. Visually observable petroleum contamination was noted in the central portion of the site in soils sampled immediately above the water table.

Finally, an investigation to locate potential discrete contaminant sources at the site and determine whether site conditions warranted a removal action to protect public health, welfare, or the environment. The investigation focused on defunct underground oil and fuel storage tanks and piping, subsurface drains, eroding asphaltic materials eroding along the shoreline, and free product (petroleum hydrocarbons). This investigation determined that there were no discrete contaminant sources.

FATE AND TRANSPORT

Use of petroleum-based fuels and deposition of fuel combustion byproducts have introduced a wide range of petroleum hydrocarbons into the OFFTA site soils. Over the many years since fire fighting training activities have ceased, most of the volatile and soluble petroleum hydrocarbons have apparently partitioned to the vapor phase or dissolved phase and have been degraded or transported off-site, leaving behind a relatively insoluble and recalcitrant petroleum residue. The much less soluble and volatile PAHs are still present at high concentrations in the soils in the central portion of the site. These contaminants will continue to leach into the groundwater, but the solubility and adsorptive properties of these contaminants should keep groundwater PAH concentrations low. The PAHs in nearshore marine sediments may have originated from off-site as well as onsite sources.

Most of the arsenic and chromium in the OFFTA soils and groundwater may be naturally occurring. The near neutral pH and low dissolved oxygen content of the groundwater enhance the mobility of arsenic. By contrast, the presence of organic carbon in the soil zone and reducing conditions in the aquifer reduce the mobility of chromium in both environments. Off-site sources are probably a major contributor to the high chromium concentrations observed in marine sediments.

Lead concentrations in soil samples were often much higher than those in background samples, indicating the presence of lead contamination in the site soils. The lead appears to be immobilized by mineral solubility constraints and adsorption to soil organic matter, clay minerals, and metal oxyhydroxides. The lead in the marine sediments probably originated from both onsite and off-site sources.

HUMAN HEALTH RISK ASSESSMENT

The Baseline Human Health Risk Assessment evaluated exposure to surface soil, subsurface soil, sediment, and shellfish (lobsters, clams, and mussels). This risk assessment considered exposures under residential scenario, recreational and visitor scenarios, and a worker scenario, as well as ingestion of shellfish taken recreationally and for subsistence.

For surface soil, the total cancer risks under the residential, recreational, and worker scenarios were 2.5E-5, 5.4E-6, and below 1E-6, respectively. For subsurface soil, cancer risks under the residential and worker scenarios were 4.0E-5, and 1.4 E-6, respectively. No recreational exposures were calculated for subsurface soils. Non cancer risks for surface and subsurface soil under all scenarios did not exceed 1.0 for any target organ group.

For sediment, the cancer risks under the residential and recreational (shoreline visitor) scenarios were 2.2E-5 and 1.6E-6 respectively. Non cancer risks for sediment did not exceed 1.0 for any target organ group.

For shellfish ingestion, the cancer risks exceeded the risk range of 1E-4 to 1E-6 under the subsistence fishing and lifetime recreational scenarios for ingestion of lobster, clams, and mussels. Primary contributors to these risks is arsenic, and other contributors include PCBs, PAHs, mercury, cadmium and chromium as calculated from analytical results. It should be noted that the subsistence fishing scenario does not currently exist and is unlikely in the future because of the current ban on shellfishing in the area. The unrealistic assumption that all of the fisherman's catch would be obtained continually from waters adjacent to the OFFTA site makes this a very conservative scenario.

Arsenic is present in fish and shellfish tissue in an organic form of arsenobetanine, which is non-toxic. The risk calculations are performed based on the presence of this arsenic present as inorganic arsenic. Therefore, the risk values for seafood ingestion from this site are biased high and could be overestimated by as much as a factor of 10. In addition, the exposure scenarios used for the risk assessment, particularly the use of subsistence fishing, are biased high and it is highly unlikely that exposures to the degree used for risk estimation could effectively be achieved.

ECOLOGICAL RISK ASSESSMENT

Ecological risks were assessed for the offshore environments of Coasters Harbor and Narragansett Bay from contaminants associated with the OFFTA. The ecological risk assessment (ERA) found a high probability for adverse risk at one station (station 5), close to the outfall at the central shoreline of the site, likely from PAHs and metals present at this area. Intermediate probability for risk was estimated for a number of stations at the nearshore area and in the harbor sediments, including one reference station south of Coasters Harbor, but because there was a lack of a clear exposure-response relationship found, these risks may be considered acceptable from an ecological perspective. Low probability for adverse risk was estimated for the remainder of the stations, including one reference station, and nearshore stations more exposed to rough water conditions. The observed risks at these stations are considered acceptable from an ecological perspective. A baseline condition associated with relatively pristine conditions was not observed at any of the site or reference stations evaluated in this assessment.

FINDINGS AND CONCLUSIONS

Although the estimated RME incremental cancer risks for a lifetime resident exposed to surface soil and subsurface soil are within EPA's target risk range of 1×10^{-4} to 1×10^{-6} they are slightly greater than the 1×10^{-5} benchmark used by RIDEM. Contaminants in the soil also exceed RIDEM's residential direct exposure criteria and GB leachability criteria. Surface soil lead levels are not predicted to result in blood-lead levels with potential for adverse effects to exposed residential children, while adverse effects cannot be ruled out from subsurface soil lead exposure to residential children. Therefore, a feasibility study should be prepared to develop and evaluate long-term soil response actions necessary to protect human health and groundwater quality.

Shoreline sediment was found to pose cancer risks through direct contact to human receptors above the target level. The estimated RME cancer risk for a lifetime resident is within EPA's target risk range but slightly greater than the 1×10^{-5} benchmark used by RIDEM. Therefore, a feasibility study should be prepared to develop and evaluate long-term sediment response actions necessary to protect human health.

For shellfish ingestion, the cancer risks exceeded the risk range of 1×10^{-4} to 1×10^{-6} under the primary subsistence fishing and lifetime recreation scenarios. However, the subsistence fishing scenario and possibly the lifetime recreational fishing scenario are not realistic.

Based on the observations summarized in the marine ERA, an exposure-response relationship was noted from PAHs at one station (high potential for risk). A number of other stations showed intermediate potential for risk (exposure or response, with no direct relationship found). While the intermediate risk stations are considered acceptable from an ecological perspective, the presence of the high-risk station indicates that these stations should be evaluated in the risk management decision process. Therefore, a feasibility study should be prepared to develop and evaluate long-term response actions necessary to protect ecological receptors.

The groundwater beneath Coasters Harbor Island (locality of the OFFTA site) is classified as GB, indicating that it is not suitable for use as a current or potential source of drinking water, as described in the Rhode Island Rules and Regulations for Groundwater Quality. Since groundwater contaminant levels do not exceed the RIDEM GB Groundwater Objectives and because federal drinking water maximum contaminant levels (MCLs) are not applicable (the aquifer will not be used for drinking water) no further evaluation of groundwater other than monitoring is required.

1.0 INTRODUCTION

This report presents the Remedial Investigation (RI) for the Old Fire Fighting Training Area (OFFTA) site (Site 09), located at Naval Station Newport (NAVSTA Newport) in Newport, Rhode Island (formerly the Naval Education and Training Center [NETC]). The RI is submitted in partial fulfillment of the Remedial Investigation/Feasibility Study (RI/FS) for the site. The RI/FS was initiated by TRC Environmental Corporation (TRC) on behalf of the United States Navy (Navy) under contract N62472-86-C-1282 for the Engineering Field Activity Northeast Naval Facilities Engineering Command (EFA Northeast). The RI/FS is being completed by Tetra Tech NUS, Inc. (TtNUS), formerly Brown and Root Environmental (B&RE), on behalf of the Navy under Contract Number N62472-90-D-1298 for EFA Northeast.

TRC conducted Phase I and Phase II remedial investigations for the site between 1990 and 1994. The findings of these investigations were presented in the Draft Final Old Fire Fighting Training Area Remedial Investigation Report, Naval Education and Training Center, Newport, RI (TRC, August 1994), which was reviewed and commented on by the United States Environmental Protection Agency, Region I (EPA) and the Rhode Island Department of Environmental Management (RIDEM) in late 1994. Based on the comments received, it was determined that the RI report could not be finalized until additional offshore ecological characterization was completed and the results integrated into a revised Draft Final RI Report.

The offshore ecological investigations were conducted in 1998 and a Marine Ecological Risk Assessment (ERA) for the site was completed in April 2000. The findings of the ecological investigations and ERA have been integrated into this revised Draft Final RI Report. Additionally, TtNUS conducted three supplemental investigations between 1997 and 2000: a Source Removal Evaluation, a Phase III RI and Human Health Risk Assessment for Recreational Use of the site, and a Background Soil Investigation. The findings of these investigations are also integrated into this revised Draft Final RI report.

This document provides a summary of background information about NAVSTA Newport and the Old Fire Fighting Training Area and includes summaries of the scope and findings of the Phase I RI, Phase II RI, Source Removal Evaluation, Phase III RI, Background Soils Investigation, and the offshore ecological risk investigations. These investigations are integrated into the discussions of the nature and extent of the contamination at the site to provide a comprehensive site contamination assessment. This document also includes a human health risk assessment (HHRA) and the findings of the marine ERA. The HHRA has been revised from the 1994 report to address comments provided by EPA and RIDEM on the Draft Final RI Report and to incorporate the additional data collected from 1997 through 2000. As stated previously, the findings of the marine ERA has been incorporated into this revised report to address regulatory comments on the Draft Final RI Report.

This document summarizes the investigations identified above; refer to the original reports for comprehensive discussions of the individual investigations:

- Phase I Remedial Investigation Final Report, Naval Education and Training Center, Newport, RI (TRC, January 1992);
- Source Removal Evaluation Report for Old Fire Fighting Training Area, Naval Education and Training Center, Newport, RI (B&RE, January 1998);
- Human Health Risk Assessment Report for Recreational Use, Old Fire Fighting Training Area/Katy Field, Naval Station Newport, Newport, RI (TtNUS, May 1999);
- Draft Background Soil Investigation for Old Fire Fighting Training Area, Naval Station Newport, Newport, RI (TtNUS, May 2000); and
- Old Fire Fighting Training Area Marine Ecological Risk Assessment Report, Naval Station Newport, Newport, RI (Science Applications International Corporation [SAIC] and The University of Rhode Island Graduate School of Oceanography [URI], April 2000).

1.1 REPORT ORGANIZATION

This RI report has been divided into eight sections, with tables and figures presented in back of the text. This section of the report, Section 1.0, provides background information about NAVSTA Newport and the OFFTA site, including the location, description, and history of the base and the site and a discussion of previous investigations conducted at the site. Section 2.0 of the report provides an overview of the field investigations that were conducted to assess the contamination and physical conditions at the OFFTA site. Section 3.0 provides a description of the site physical characteristics, including regional physiography, regional and site-specific geology, and regional and site-specific hydrology and hydrogeology. Section 4.0 presents a discussion of the nature and extent of contamination at the site. Section 5.0 presents a discussion of the fate and transport of contaminants at the site. Section 6.0 presents the results of the HHRA. Section 7.0 presents the results of the marine ERA. Section 8.0 presents the summary and conclusions.

1.2 OBJECTIVES AND SCOPE OF THE INVESTIGATION

The general objectives of the RI site investigation are to determine the nature and extent of site contamination, sources of contamination, potential contaminant migration pathways, potential contaminant receptors, and associated exposure pathways. This information is necessary to determine whether, and to what extent, a threat to human health or the environment exists, and to develop and evaluate remedial action alternatives for the site, as necessary.

The scope of the sampling efforts for this site were developed to meet site-specific RI/FS objectives. However, the specific objectives of each investigation were refined based upon the findings of the previous investigations and remaining data needs. Below is a list of the RI objectives for the Old Fire Fighting Training Area investigation:

- Determine the site background soil and groundwater quality
- Determine the nature and extent of site surface soil contamination
- Determine the nature and extent of site subsurface soil contamination
- Determine the nature of the soil mounds on the site
- Determine the nature and extent of groundwater contamination
- Determine the nature and extent of sediment and biota contamination in the marine environment adjacent to the site
- Determine the fate and transport of contaminants in site media
- Determine the risks posed by site contaminants to humans and the environment

1.3 NAVSTA NEWPORT BACKGROUND INFORMATION

This section presents an overall description of NAVSTA Newport as well as its history, a summary of response actions taken at the base, and a summary of previous environmental investigations conducted at the base.

1.3.1 <u>NAVSTA Newport Description</u>

NAVSTA Newport is located approximately 60 miles southwest of Boston, Massachusetts and 25 miles south of Providence, Rhode Island. It occupies approximately 1,063 acres, with portions of the facility located in the City of Newport and Towns of Middletown and Portsmouth, Rhode Island. The facility layout is long and narrow, following the western shoreline of Aquidneck Island for nearly 6 miles facing the east passage of Narragansett Bay. A general location map of the NAVSTA Newport is provided as Figure 1-1.

1.3.2 <u>NAVSTA Newport History</u>

The NAVSTA Newport is located north of Newport, Rhode Island, (Figure 1-1) on the west shore of Aquidneck Island facing the east passage of Narragansett Bay. Extensive information in these areas has already been gathered in the Initial Assessment Study (IAS) (Envirodyne Engineers, 1983), Confirmation Study (CS) (Loureiro Engineering Associates, 1985), and Phase I RI/FS (TRC, 1992). The history of the base (indented paragraph below) are excerpted from the IAS (IAS pp 5-6 to 5-14):

The Newport area was first used by the Navy during the Civil War when the Naval Academy was moved from Annapolis, Maryland to Newport in order to protect it from Confederate troops. The Naval Academy operated at Newport for about four years before returning to Annapolis.

In 1869, the experimental Torpedo Station at Goat Island was established. This was the Navy's first permanent activity at Newport. The station was responsible for developing torpedoes and conducting experimental work on other forms of naval ordinance.

In 1881, Coasters Harbor Island was acquired by the Navy from the City of Newport and used for training purposes. In 1884, the Naval War College was established on the island. A causeway and bridge linking the island to the mainland was constructed in 1892. In 1884, the USS Constellation was permanently anchored as a training ship for the Naval War College.

The Melville area was established as a coaling station for the steam-powered ships in 1900. The Navy purchased 160 acres of land and constructed the Narragansett Bay Coal Depot. With the advent of ships burning liquid fuel, it became necessary to add oil tanks. Consequently, in 1910, four fuel oil tanks were added in the Melville area.

In 1913, the Navy established the Naval Hospital on the mainland of Aquidneck Island, directly adjacent to Coasters Harbor Island. At this time, the main hospital building was constructed.

The outbreak of World War I caused a significant increase in military activity at Newport. Some 1,700 men were sent to Newport and housed in tents on Coddington Point and Coasters Harbor Island. A bridge was built at this time connecting Coddington Point with Coasters Harbor Island In 1918, Coddington Point was purchased by the Navy. Much of the base organization was then transferred to Coddington Point. During the war, numerous destroyers and cruisers were fueled by the Melville coal depot and fuel tanks. By this time, a pipeline had been extended to the north fueling pier and two additional oil tanks constructed.

Following World War I, fuel oil gradually replaced the use of coal by the Navy fleet. In 1921, the Coal Depot was changed to the Navy Fuel Depot. In 1931, the coal barges and coaling equipment were sold to the highest bidder.

In 1923, some two hundred buildings, which were part of the emergency war camps established on Coddington Point, were stripped and sold for scrap. The station was put on caretaker status in 1933. The base remained relatively inactive until the onset of World War II.

Reactivation of the base occurred in the late 1930s as a result of military build-up in Europe. Just prior to the reactivation, a 1938 hurricane and tidal wave had destroyed or severely damaged over 100 buildings and much of the sea walls. In 1940, Coddington Cove was acquired for use as a supply station, and hundreds of Quonset huts were constructed throughout the base. Additional barracks were constructed on Coasters Harbor Island, increasing the base housing capacity to over 3,500 men. Power plant facilities were also constructed at this time. Coddington Point was reactivated to house thousands of recruits. The Anchorage housing complex in the Coddington Cove area was constructed in 1942. In the Melville area, additional fuel facilities were constructed along with a Motor Torpedo Squadron Boat Training Center and nets for harbor defense were constructed. Tank Farms 1 through 5 were constructed during this time period. The Fire Fighting School, Fire Control Training Building, and the Steam Engineering Building were constructed in 1944.

The Torpedo Station at Goat Island was very active during World War II and had expanded its operation to Gould Island. The Torpedo Station employed more than 13,000 people and manufactured 80 percent of all torpedoes used by our country during the war. The station was the largest single industry ever operated in Rhode Island.

Following World War II, naval activities at Newport converted to a peace time status. This resulted in a reduction of naval activity. Some 300 Quonset huts and buildings were removed, and the entire naval complex was consolidated into a single naval command designated the U.S. Naval Base in 1946.

The Naval Base adjusted to its peace time status by increasing its activities in the fields of research and development, specialized training, and preparedness for modern warfare. There was a brief period during the Korean War when some 25,000 sailors trained at Newport.

In 1951, the Torpedo Station was permanently disestablished after 83 years of service. Future manufacture of torpedoes was to be awarded to private industry. In place of the Torpedo Station, a new research and development facility, the Naval Underwater Ordinance Station, was established and given the responsibility of overseeing the private contractors. The Officer Candidate School was also established in 1951.

In 1952, the Training Station and other naval schools were disestablished, and the U.S. Naval Station and the U.S. Naval Schools Command were established.

In 1955, Pier 1 was constructed, with Pier 2 being added in 1957. Newport became the headquarters of the Commander Cruiser-Destroyer Force Atlantic in 1962. Some 55 naval warships and auxiliary craft were homeported at Newport. New housing and bachelor quarters were added in the late 50's and early 60's.

Major expansion of the Naval War College occurred during the late 50's and early 70's, transforming the college into a major university. In July of 1971, the Naval Schools Command was restructured and named the Naval Officer Training Center (NOTC).

In April of 1973, the Shore Establishment Realignment Program (SER) was announced and resulted in the largest reorganization of Naval forces in the Newport area. The fleet stationed in Newport was relocated to other naval stations on the east coast. SER resulted in the disestablishment of the Naval Communication Station and the Fleet Training Center and related activities. The Public Works Center, Naval Supply Center, Naval Station and Naval Base were absorbed by NOTC. In April of 1974, NOTC was changed to the Naval Education and Training Center (NETC).

From 1974 to the present, research and development and training have been the primary activities at Newport. The base was renamed Naval Station Newport in 1998. The Major commands currently located at NAVSTA Newport include the Naval Education and Training Center, Surface Warfare Officers School Command, Naval Undersea Warfare Center, and the Naval War College.

1.3.3 Previous Investigations at NAVSTA Newport

Previous investigations at NAVSTA Newport included: an Initial Assessment Study (IAS) in 1983; a Confirmation Study (CS) in 1986; a Closure Plan for Tanks 53 and 56 at Tank Farm Five in 1988; and a Phase I RI/FS investigation completed in 1991.

The Initial Assessment Study (IAS), conducted by Envirodyne Engineers, Inc., St. Louis, Missouri, for the Navy in 1983, identified 18 sites at which contamination was suspected that may have posed a threat to human health or the environment. Six of these sites were judged to require further study and were investigated under a Confirmation Study (CS), conducted by Loureiro Engineering Associates, Avon, Connecticut, which was completed in 1986.

The Phase I RI/FS investigation was conducted on five sites: Site 01 - McAllister Point Landfill; Site 02 - Melville North Landfill; Site 09 - Old Fire Fighter Training Area; Site 12 - Tank Farm Four; and Site 13 - Tank Farm Five. Three of the NAVSTA Newport sites - McAllister Point Landfill, Melville North Landfill, and Tank Farm 4 - were investigated in both the IAS and CS. Tank Farm 5 was studied in the IAS, and tank numbers 53 and 56 were extensively studied as part of a tank closure plan. The Old Fire Fighting Area had not been sampled or extensively studied prior to the Phase I RI. The numbers for the five RI/FS sites were assigned during the IAS and were retained during the Phase I RI/FS investigation for consistency.

The entire NAVSTA Newport was listed on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites in November 1989. The NPL identifies those sites which pose a significant threat to the public health and environment. Four RI/FS sites at NAVSTA Newport (McAllister Point Landfill, Old Fire Fighting Training Area, and Tank Farm Four and Tank Farm Five) are currently being addressed by the Navy under the Department of Defense Installation Restoration (IR) Program. This program is similar to the U.S. EPA's Superfund Program authorized under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

The fifth Phase I RI/FS site, the Melville North Landfill, is being addressed by the Navy under RIDEM regulations, rather than under the IR program. The non-NPL status of this site and its resulting exclusion from the IR program, is due to the site not being owned by the Navy at the time of the NPL listing of the NAVSTA Newport. Six additional sites or study areas (Tank Farm One, Tank Farm Two, Tank Farm Three, Coddington Cove Rubble Fill Area, NUSC Disposal Area, and the Gould Island Electroplating Shop) have also been the subject of environmental investigations and will be the subject additional investigations under the IR program in the future.

1.3.4 History of Response Actions at NAVSTA Newport

This section presents a brief chronology of the interaction between the RIDEM, other regulators, and NAVSTA Newport concerning environmental issues at the Naval base.

Chronology of Regulatory and Navy Actions at NAVSTA Newport

The following chronology was obtained from environmental reports prepared for the Navy and a review of information in RIDEM files. Sites referenced in this section are depicted on Figure 1-2.

> **Mid-1960's** - burning of oil tank bottom sludges generated from NAVSTA Newport Tank Farms was discontinued due to air pollution regulations.

Unknown Date - the NAVSTA Newport shoreline is closed to shellfishing due to concerns about bioaccumulation of contaminants in Narragansett Bay from sites at the facility.

Post 1971 - the required scrubbers were installed on the Navy's classified document incinerator.

April 1973 - the Shore Establishment Realignment (SER) Program resulted in drastic reductions in Navy personnel at NAVSTA Newport and initiated the process of excessing (selling) large portions of the base's real estate.

September 11, 1980 - the Naval Assessment and Control of Installation Pollutants (NACIP) program was initiated. The purpose of this program is to systematically identify, assess, and control environmental contamination from past use and disposal of hazardous substances at Navy and Marine Corps installations.

1982 - RIDEM adopted hazardous waste regulations which classified waste oil as a hazardous waste.

March 1983 - the IAS of NAVSTA Newport was completed. Eighteen potentially contaminated sites were identified under the IAS, including OFFTA (Site 9 in the IAS).

1984 - The Navy ceased using Tanks 53 and 56 at Tank Farm Five for waste oil storage.

1984 - The Defense Environmental Restoration Program (DERP) was established to promote and coordinate efforts for the evaluation and cleanup of contamination at DOD installations. A major element of the program was the establishment of the Installation Restoration Program (IRP). The IRP involves the investigation and cleanup of contaminated sites in compliance with the procedural and substantive requirements of CERCLA, as amended by SARA, as well as regulations promulgated under these acts or by applicable State law.

1986 - RIDEM implemented new regulations for the operation and closure of underground storage tanks used to hold oils and hazardous materials.

May 1986 - the Confirmation Study for NAVSTA Newport was completed at the following six sites.

- Site 01 - McAllister Point Landfill
- Site 02 - Melville North Landfill
- Site 07 - Tank Farm One
- Site 12 - Tank Farm Four
- Site 14 - Gould Island Disposal Area
- Site 17 - Gould Island Electroplating Shop

1987 - A Tank Closure Plan for Tanks 53 and 56 located at Tank Farm Five was completed (Environmental Resource Associates).

1988 - A Technical Review Committee was convened to facilitate communication of information with regard to actions to be undertaken at NAVSTA Newport. TRC members include representatives from the U.S. Navy, EPA - Region I, RIDEM, the City of Newport, the Towns of Portsmouth and Middletown, and local citizens groups.

November 21, 1989 - NAVSTA Newport was listed on the National Priority List.

1989 - A Phase I RI/FS Work Plan for four NAVSTA Newport sites was prepared. These sites included:

- McAllister Point Landfill (Site 01)
- Old Fire Fighting Training Area (Site 09)
- Tank Farm Four (Site 12)
- Tank Farm Five (Site 13)

1989 - The Phase I RI/FS Work Plan was also developed for Site 02 - Melville North Landfill. This Work Plan was undertaken pursuant to the Navy's authority under CERCLA, Executive Order 12580, and the DERP. The Melville North Landfill was excessed (or sold) by the Navy prior to being listed on the NPL and is being addressed by the Navy as a Formerly-Used Defense Site (FUDS).

The Navy has undertaken, and plans to continue to undertake IRP activities for the Melville North Landfill pursuant to the Navy's authority under CERCLA, Executive Order 12580, and the DERP.

1990 - A Community Relations Plan was issued for NAVSTA Newport by the Navy. Public Information Repositories were also established to allow public access to NAVSTA Newport documents.

June 1991 - A groundwater investigation was conducted as part of the tank closure investigation of Tanks 53 and 56 at Tank Farm Five.

November 1991 - The Draft Phase I RI and Risk Assessment Report on the four NAVSTA Newport sites (McAllister Point Landfill, Old Fire Fighting Training Area, Tank Farm Four, and Tank Farm Five) and Melville North Landfill was completed.

July 1992 - A Draft Study Area Screening Evaluation (SASE) Work Plan for investigation of six suspected sites at NAVSTA Newport was completed. The sites include:

- Coddington Cove Rubble Fill Area (Site 04)
- Tank Farm One (Site 07)
- NUSC Disposal Area (Site 08)
- Tank Farm Two (Site 10)
- Tank Farm Three (Site 11)
- Gould Island Electroplating Shop (Site 17)

Summer 1992 - The contents of Tanks 53 and 56 at Tank Farm Five were removed and the tank interiors cleaned.

August 1992 - The Defense Fuel Supply Point (DFSP) initiated investigations of Tank Farm One, Tank Farm Two, and Tank Farm Three.

September 1992 - The Draft Phase II RI/FS Work Plan for the four NAVSTA Newport sites (McAllister Point Landfill, Old Fire Fighting Training Area, Tank Farm Four, and Tank Farm Five) and Melville North Landfill was completed.

September 29, 1992 - A Record of Decision (ROD) was signed by the U.S. Navy, RIDEM, and EPA for the implementation of an interim groundwater pump and treat remedy at Tank Farm Five.

October 1992 - A soil investigation was conducted as part of the tank closure investigation of Tanks 53 and 56 at Tank Farm Five.

December 1992 - The final Study Area Screening Evaluation (SASE) Work Plan for investigation of three suspected sites at NAVSTA Newport was completed. The three sites include:

- Coddington Cove Rubble Fill Area (Site 04)
- NUSC Disposal Area (Site 08)
- Gould Island Electroplating Shop (Site 17)

SASE investigations of Tank Farm One (SA-07), Tank Farm Two (SA-10), and Tank Farm Three (SA-11) were being reevaluated pending completion of on-going DFSP contracted investigation activities of these areas.

January 1993 - A Draft Soil Investigation near Tanks 53 and 56 was submitted to the Navy, the EPA, and RIDEM for review and comments.

March 1993 - The Final Phase II RI/FS Work Plan for the four RI/FS sites was completed.

August 1993 - Remedial Design Work Plan completed for the McAllister Point Landfill Cap.

September 27, 1993 - Record of Decision (ROD) signed for the Source Control Action, a Subtitle C landfill cap, for the McAllister Point Landfill.

December 1993 - The 35 percent Design Development for the McAllister Point Landfill cap was submitted.

December 1993 - Construction activities began for the Tank Farm 5 groundwater interim remedial measure.

1993 and 1995 - Hot spot removal actions conducted at Melville North Landfill.

January 1994 - Phase II RI field work completed at McAllister Point Landfill and Old Fire Fighter Training Area.

January 1994 - The 90 percent final Design Analysis for removal actions at the Melville North Landfill was submitted.

January 1994 – The 90 percent final Design Analysis for the Soil Remediation at Tank 53 at Tank Farm Five was submitted.

February 1994 - The Draft Phase II RI Report for the McAllister Point Landfill was submitted to the Navy, EPA, and RIDEM for review and comment.

March 1994 - The 90 percent Design Analysis for the McAllister Point Landfill cap was submitted.

March 1994 - Bidding Document submission (100 percent) for the Soil Remediation at Tank 53 at Tank Farm Five.

March 1994 - Bidding Document submission (100 percent) for the Soil Removal Action at the Melville North Landfill

1994 to 1997 – Conducted removal actions at Derecktor Shipyard (Site 19), including: removal of drums, sandblast grit, and storage tanks, and demolition of five buildings.

1994 to 1997 - Tanks at Tank Farms 4 and 5 cleaned and ballasted.

1995 - Construction activities begun for the McAllister Point Landfill cap.

October 1996 - McAllister Point Landfill cap construction completed.

1996 to 1997 - Tanks at Tank Farms 1, 2, and 3 cleaned and ballasted.

1997 to 1998 - Tanks at Tank Farm 4 demolished.

1999 to 2000 - Remedial action involving excavation and off-site disposal of contaminated soils conducted at Melville North Landfill.

March 1, 2000 - ROD signed for the Marine Sediment/Management of Migration Operable Unit at the McAllister Point Landfill. Selected remedial action involves dredging and disposal of contaminated sediment and landfill debris in nearshore areas and long-term monitoring of offshore areas.

1.4 OLD FIRE FIGHTING TRAINING AREA BACKGROUND INFORMATION

This section presents the OFFTA site description and history, and describes previous environmental investigations conducted at the site.

1.4.1 Site Description

The OFFTA site is located at the northern end of Coasters Harbor Island (see Figure 1-3). The site occupies approximately 5.5 acres and is bordered by Taylor Drive to the south and is surrounded by Coasters Harbor (part of Narragansett Bay) to the east, north, and, west. The site contains a picnic area, playground, and baseball field. A one story concrete block building (Building 144) is located along the southern side of the site. The building and recreational facilities at the site are not currently in use. Access to the site is restricted by a chain link fence along its eastern, southern, and western sides.

Unique topographic features at the site include two soil mounds: one that is approximately 20 feet high (30 ft. above mean low water (MLW)) located in the center of the site, and another that is approximately 6 feet high (16 ft. above MLW) located on the western side of the site. The rest of the site is generally flat, with surface elevations ranging from 8 to 12 feet above MLW. With the exception of the baseball infields, the site is entirely vegetated with grass. A site plan is presented as Figure 1-4.

1.4.2 Site History

The site was home to a Navy fire fighting training facility from World War II until 1972. During the training operations, fuel oils were ignited in various structures at the site that simulated shipboard compartments, and then extinguished by sailors. The general layout of the training facility is shown on a 1943 drawing, which details the planned design of the facility (Figure 1-5). It is not known whether the facility was constructed exactly as shown on this design drawing; however, a 1944 aerial photo of Coasters Harbor Island (Figure 1-6) confirms that the drawing is a reasonable representation of the facility at that time.

It was reported that the two buildings labeled "Carrier Compartment" on Figure 1-5 had a water/oil mixture injected into them which was set on fire for fire fighting practice. Underground piping reportedly carried the water/oil mixture to the buildings and from the buildings to the oil-water separator shown on the figure. There is no other known information available concerning the prior fire fighting training operations.

The fire fighting training facility was closed in 1972. Upon closure, the training structures were reportedly demolished and buried in two mounds on the site, then the entire area was covered with topsoil The quantity of demolition debris buried on the site is unknown. The site was then converted to a recreational area with a playground, a picnic area with an open pavilion and barbecue grills, and a baseball field. The field was dedicated on July 4, 1976 and used as a recreational area until its closure in 1998. In May 1998 the EPA requested review of soil data from Katy Field because of EPA's concern of more intensive use of the area. After review of all the data collected (over 100 surface soil samples) it was determined that contaminants in surface soil do not present a risk to adults or children who played daily at Katy Field. The Navy decided to keep the site closed until all investigations under CERCLA had been competed.

In its 22 years of use as recreation area, the site was used for organized activities including youth day camps, picnic functions, and little league baseball (1 year only), as well as for general recreation. A child day care center operated out of Building 144 on the site from approximately 1983 through January 1994 when it was relocated off-site to a larger facility on base.

1.4.3 Aerial Photography and Facility Map Interpretation

Aerial photos and facility maps for the period from 1939 through 1988 were reviewed to better evaluate the site history. Activity on the site appears to date back to approximately 1943. A 1943 facility design map (Figure 1-5) indicates the locations of structures and site features associated with fire fighting training exercises. An aerial photo taken in May 1944 (Figure 1-6) depicts the site, with structures in a similar layout to that shown on the 1943 facility design map. Based on the design map and subsequent facility condition maps, on-site structures included an administration building, hose house, two carrier compartments, smothering pit, separator pit, foam pit, simulated ship structures, suction pumps and oil tanks. Copies of the facility conditions maps which show the site area and were reviewed are provided in Appendix A. Also provided with some of these maps is an index of the structures on or adjacent to the site. The information in these indexes was obtained from master indexes which accompanied several of the maps.

The indexes that accompanied some of the facility conditions maps indicate that the on-site structure that was used in recent years as a day care center was once used as "wash and dressing rooms". No significant visible site changes are noted from 1944 until a 1975 aerial photo of the site, when the structures and facilities associated with the fire fighting training area are no longer evident, with exception of the "hose house" and day care center structure. As of 1987, the site appears similar to its current condition, with soil mounds visible in the central and western portions of the site and a pavilion in the east-central portion of the site.

1.4.4 Previous Site Investigations

This site was not investigated in detail during the IAS and was not studied in the CS. The site was not studied in the CS because the conclusions of the IAS stated that the site did not warrant any further action. It was decided by the Navy to investigate the site further under an RI after the discovery of oily subsurface soils during a 1987 geotechnical boring investigation related to the planned expansion of the previous on-site child care facility. The Phase I RI and subsequent investigations are discussed in Section 2.0 of this report.

2.0 STUDY AREA INVESTIGATIONS

This section provides information on the field investigation activities conducted for the OFFTA site that are incorporated in the evaluations presented in this RI report. The OFFTA Site RI field investigations were conducted over a 10-year period (1990-2000) during which various sampling methodologies and analytical procedures were implemented during sample collection and analysis for the different data sets. Analytical procedures and groundwater sampling methods were reviewed to evaluate the representativeness and comparability of the data from the different data sets.

To ensure that the samples collected over this time span were analyzed and validated in a consistent and appropriate manner a review was conducted of laboratory analytical procedures, reporting detection limits, and holding times. The review is provided in Appendix R-1. The review findings are summarized below:

1. Organic data were analyzed either by the SW846 EPA Method 8260B or the most recently updated U.S. EPA organic Contract Laboratory Program (CLP) Scope of Work (SOW) available at the time of analysis, and can be considered comparable.
2. Inorganic data were analyzed by the most recently updated inorganic CLP SOW available at the time of analysis, and can be considered comparable.
3. Analytical data was validated by equivalent data validation guidelines that were the strictest quality control available at the time of analysis.
4. Holding times were within the required quality control limits.
5. Detection limits are in compliance with the organic and inorganic CLP SOW

A review of the groundwater sampling data was performed to ensure that the representativeness and comparability of the inorganic data from each investigation was considered when evaluating and comparing groundwater analytical data collected using different sampling methodologies. The review is provided in Appendix R-2. The review indicates that the groundwater data collected using bailers indicates a higher concentration of metals compared data generated using the low stress/flow sampling method and filtered bailer sample method. This difference in metal concentration is associated with the level of suspended solids in the sample. Based on this review the 1997 low stress/flow sampling results are more representative of the groundwater metal concentrations at the OFFTA site.

2.1 PHASE I RI SITE INVESTIGATION

This section summarizes the Phase I RI field investigation activities and findings. Refer to the Phase I RI Report (TRC, 1992) for a more comprehensive discussion of the investigation activities and results The Phase I RI site investigation activities were conducted by TRC between April and July 1990 and included a soil gas survey, geophysical surveys, surface soil sampling, soil boring sampling, and monitoring well installation and sampling. Figure 2-1 and Plate A-1 in Appendix B show the locations of the Phase I RI samples.

The Phase I RI samples were analyzed by Weston Analytics in Lionville, Pennsylvania. The samples were analyzed for compounds included under the U.S. EPA Contract Laboratory Program (CLP) target compound list/target analyte list (TCL/TAL). Non-CLP analyses were performed according to established EPA protocols, current at the time of the investigation. Appendix J contains the sample index for the Phase I RI samples collected at the site. Lists of the TCL and TAL compounds/analytes are provided in Tables 2-1 and 2-2, respectively. All of the sample analytical results are discussed in Section 4.0 of this report and presented in data summary tables in Appendices K and L.

2.1.1 Phase I Soil Gas Survey

A total of 81 soil gas points were installed on a 50-foot spaced grid during the Phase I soil gas exploration program. In general, elevated soil gas readings were obtained in the central portion of the site. The results of the soil gas surveys are provided in Appendix D.

2.1.2 Phase I Geophysical Survey

Electromagnetic (EM) and magnetometer surveys were conducted on a 50-foot spaced grid across the site. The findings of these surveys are presented in Appendix C. The results of the surveys indicated the presence of several anomalies across the site. Several of the anomalies were suspected to be underground storm sewer pipes. The EM data also indicated the presence of subsurface conductive material in the north-central portion of the site (see area "A" on Phase I EM contour map in Appendix C). The elevated conductivity readings in this area were suspected to be related to past site uses (e.g., oily soils or groundwater, subsurface structures) or conductive salt water intrusion from the bay. The magnetic data indicated the presence of a large amount of buried metal in the central portion of the site (see area "A" on Phase I magnetic contour map in Appendix C), at the location of the large soil mound.

2.1.3 Phase I Soil Assessment

The Phase I soil investigation included collection of surface and subsurface soils from locations throughout the OFFTA site. Surface soil samples were collected from a depth of 0 to 6 inches at six locations. Subsurface soil samples were collected from depths ranging from 2 to 14 feet below ground surface (bgs) at 7 soil boring locations and 2 monitoring well locations on the site and one monitoring well location approximately 75 feet south of the site, across from Building 144. Figure 2-1 presents the Phase I sample locations. The Phase I RI soil boring and well boring logs are presented in Appendix E.

Volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals were detected in on-site soils. The major areas where contaminants were detected in the soils at elevated levels include the following:

- Northern area -VOCs (MW-2), SVOCs (MW-2 and B-3), and metals (MW-2 B-3, and B-5);
- Central area - VOCs (B-6) and metals (MW-3 and B-6);
- Western area - SVOCs (B-7) and metals (SS-4);
- Eastern area - SVOCs (SS-6), carcinogenic polynuclear aromatic hydrocarbons (PAHs) (SS-6 and B-1), and metals (B-1, B-2, and MW-1); and
- Southern area (off-site) - SVOCs (MW-5).

Significant VOC contamination (i.e., greater than 1 milligram/kilogram (mg/kg) total VOCs) was detected in subsurface soils at the depth of the water table in the central portion of the site (B-6) and in the north central portion of the site (MW-2). In the central portion of the site, detected contaminants were petroleum-related VOCs, while in the northern area, only 2-butanone was detected. Soil samples collected at both of these locations generally exhibited petroleum odors and/or visible oil contamination.

SVOCs were detected at elevated levels (i.e., greater than 10 mg/kg total SVOCs) in the northern, western, and eastern portions of the site. The subsurface samples collected from the western portion of the site (at B-7) exhibited a strong petroleum odor. SVOCs were also detected at levels greater than 10 mg/kg at the off-site well boring (MW-5). Carcinogenic PAHs were detected at levels greater than 1 mg/kg, but total SVOC concentrations were less than 10 mg/kg in samples collected from the eastern portion of the site.

Pesticides were detected at low levels (10s of ug/kg) in surface soil samples across the site. One surface soil sample (SS-1) exhibited PCBs at 80 ug/kg. PCBs were not detected in any other soil samples.

Metals were detected at levels exceeding background levels in soil samples collected throughout the central and eastern portions of the site. The highest metals levels were generally detected in subsurface soils collected at well location MW-2, in the northern portion of the site, although background metals levels were also exceeded at boring B-1. A single soil sample (SS-2) collected within the playground area of Building 144 contained 2 ug/kg tetrachloroethene; 1,751 ug/kg total PAHs; 671 ug/kg total carcinogenic PAHs; pesticides (7.2 ug/kg 4-4'-DDE); and metals at concentrations consistent with or lower than other surface soils collected at the site. The presence of the PAHs may be due to pieces of roofing paper reported in the sample.

Following Phase I, in December 1991, an additional five surface soil samples (SS-7 to SS-11) were collected by TRC from playground area to evaluate this discrepancy and identify any potential immediate human health concerns in this area, which was in active use by the child daycare facility located in Building 144 at the time. Surface soil sample (SS-2) collected from this area during the Phase I investigation was split with EPA for analysis. Elevated levels of metals were detected in the EPA split sample, but not in the associated TRC sample. During the supplemental sampling, one sample (SS-7) was collected at the same location as the original split sample, and four additional samples were collected from other locations within the fenced area. Figure 2-1 shows these supplemental locations along with locations of the other Phase I samples.

2.1.4 Phase I Groundwater Assessment

Four groundwater monitoring wells were installed at the site and one (MW-5S) was installed approximately 75 feet south of the site in April 1990. Four of the wells (MW-2S through MW-5S) were shallow wells installed in the overburden aquifer. The fifth well (MW-1R) was installed in bedrock. Groundwater samples were collected from these wells in July 1990. Figure 2-1 presents the Phase I sample locations. The Phase I RI soil boring and well boring logs are presented in Appendix E. The Phase I RI groundwater level data and tidal data are presented in Appendix H; slug test data is presented in Appendix I.

VOCs, SVOCs, and metals were detected in site groundwater samples. The major areas of the site where contaminants were detected at levels exceeding action levels include the following:

- Northern area - SVOCs (MW-2S) and metals (MW-2S);
- Central area - metals (MW-3S);
- Western area - metals (MW-4S);
- Eastern area - metals (MW-1R); and
- Southern area (off-site) - metals (MW-5S).

VOCs were not detected at concentrations exceeding groundwater action levels in any of the site groundwater samples. However, at well location MW-4S, elevated soil gas readings, petroleum odors in the soil and groundwater samples, and a sheen on the groundwater sample indicate a potential for subsurface VOC contamination in this area. Elevated soil gas readings, petroleum odors and/or she ns were also observed at other well locations at this site.

Four SVOC compounds were detected above groundwater action levels in well MW-2S in the northern portion of the site. A strong petroleum odor and sheen were observed during groundwater sampling at this well. No pesticides or PCBs were detected the in groundwater samples. While metals concentrations exceeded groundwater action levels in all site well samples, including the background well, the highest levels of metals analytes were detected in samples from the wells located in the central to northern portions of the site.

2.2 PHASE II RI SITE INVESTIGATION

This section summarizes the Phase II RI field investigation activities. The Phase II RI field investigation activities were conducted by TRC between October 1993 and January 1994 to further delineate the presence, nature, and extent of any contamination associated with the site. The scope of the Phase II field investigation was based upon the Phase II RI Work Plan (TRC, 1993), which was completed in final form in March of 1993. The Phase II field investigation activities included geophysical and soil gas surveys, surface soil sampling, test pit sampling, soil boring sampling, groundwater sampling, and storm sewer sampling. In addition, offshore sampling was conducted in August 1993 to assess the quality of the sediment and bivalves adjacent to the site in Coasters Harbor and Narragansett Bay. A survey map showing the Phase II sampling locations is provided as Figure 2-2. Plate A-1 in Appendix B provides a summary of all the Phase I and II sampling locations.

Separate discussions for each of the field investigation activities listed above are provided in Sections 2.2.1 through 2.2.6 of this report. An overview of the investigation activities for each medium is presented, including an identification of sample numbers, locations, analyses, and sample rationale. Also provided in each section is a discussion of any field observations and measurements. Samples were collected and analyzed according to the quality assurance/quality control criteria defined in the Quality Assurance Project Management Plan prepared as part of the Phase II RI Work Plan (TRC, 1993).

The Phase II RI soil and storm sewer samples were analyzed by Enseco, Inc. in Somerset, New Jersey; the groundwater and test pit samples were analyzed by Weston Analytics in Lionville, Pennsylvania. Samples were analyzed for compounds included under the U.S. EPA CLP TCL/TAL. Non-CLP analyses were performed according to the EPA protocols in effect at the time of the investigation. Appendix J contains the sample index for the Phase II RI samples collected at the site. Lists of the TCL and TAL compounds/analytes are provided in Tables 2-1 and 2-2, respectively. All of the sample analytical results are discussed in Section 4.0 of this report and presented in data summary tables in Appendices K and L.

2.2.1 Phase II Geophysical Investigation

A geophysical investigation conducted at the site consisted of a seismic refraction survey, an electromagnetic conductivity survey, and a magnetometer survey. Hager-Richter Geoscience, Inc. conducted the seismic refraction survey. The electromagnetic conductivity and magnetometer surveys were conducted by TRC. Appendix C provides the results of the Hager Richter seismic surveys as well as the results of the Phase I and Phase II electromagnetic (EM) and magnetometer surveys.

2.2.1.1 Seismic Refraction Survey

The seismic refraction survey was conducted to characterize the bedrock topography beneath the site. A seismic refraction survey is a means of assessing the depths to refracting horizons and the thickness of overlying subsurface or geologic units. Seismic refraction data interpretations are based on travel-time curves that measure the time required for a compressional seismic wave to travel from the source point to each vibration sensitive device (geophone).

Seismic Refraction Methodology

The following presents the scope and findings of the seismic survey as summarized from the Hager-Richter report provided in Appendix C. Seismic refraction data were recorded into a 48-channel Bison Model 9024 Digital Instantaneous Floating Point Stacking Seismograph. This seismograph is a microprocessor controlled instrument that records digital data and displays onto paper output. The seismograph was coupled to two 24-element seismic spread cables for a total of 48 geophones. The geophones measure only the vertical component, and their resonant frequency was 14 Hz.

Seismic energy was provided by an accelerated weight drop (Bison EWG), which drops a steel base plate at an accelerated speed onto the ground, creating seismic energy. The number of stacks per shot point was variable, and the quality of the stacked seismic signal for each shot point was verified in the field with a paper record. Five shot points were used per geophone spread. Shot points were located at the first, middle, and last geophones. Symmetrical offsets of up to 100 feet were also made from the ends of each spread to obtain bedrock arrivals from all geophones. Figure 2-3 shows the locations of the seismic refraction survey lines.

The seismic refraction survey at this site consisted of 2 lines totaling 700 feet. Seismic line 1 was oriented in an east-west direction along the southern portion of the site, and consisted of a 48-channel geophone spread, with geophones spaced at 10 feet apart. Seismic line 2 was oriented in a north-south direction across the center of the site and consisted of a 24-channel geophone spread, with geophones spaced 10 feet.

The seismic data were analyzed using a Generalized Reciprocal Method (GRM) of seismic refraction interpretation. GRM allows for some variation in the surface topography as well as lateral variations in the seismic velocity of the upper layers. The seismic refraction results are used to construct an interpreted velocity profile of the subsurface layers for each seismic line. The velocities of seismic waves are functions of the types of geologic material through which they pass. One can thus infer the general subsurface stratigraphy from the velocities determined under the survey.

Seismic Refraction Results

The seismic refraction survey at the OFFTA site identified two distinct velocity ranges. The upper material, which had a velocity range of 2,600 to 3,000 feet per second (fps), was interpreted to consist of unsaturated overburden (fill and/or sediments). The second velocity range of 11,500 to 14,300 fps was interpreted to consist of relatively competent bedrock. The saturated zone under the seismic lines occurred either within the bedrock or within a few feet of the top of bedrock. Appendix C contains all of the seismic refraction results in the Hager-Richter report.

Based on the seismic refraction results, the depth to bedrock beneath the site varies between approximately 6 and 27 feet bgs. Based on the seismic profile, there appears to be a shallow basin present in the bedrock surface at the center of seismic line number 1 and along seismic line 2.

The quality of the seismic refraction results was evaluated by comparing bedrock depths determined seismically with depths to bedrock determined in several nearby borings. In general, the correlation with the seismic results and the nearby borings is good, with the exception of boring B-17. The depth of bedrock determined seismically near B-17 is significantly deeper than that noted in the boring log. However, B-17 is located about 30 feet north of the seismic line, and other borings to the north of B-17 indicate that a bedrock knob might be present in this area.

2.2.1.2 Electromagnetic Conductivity Survey

An electromagnetic conductivity survey was conducted at the OFFTA site by TRC on October 25 and 26, 1993. The survey was conducted using a Geonics EM-31 electromagnetic terrain conductivity meter. The EM-31 has a fixed intercoil spacing of 12 feet and allows for an approximate exploration depth of between 8 and 12 feet. EM-31 surveys are used to aid in determining the location and/or extent of buried electrically conductive objects (e.g., drums, tanks, structures), or potential contaminant plumes. These features are recognized by large meter fluctuations that occur within a short distance, with the buried conductor showing up as a negative peak between two positive peaks.

EM-31 Survey Overview

An EM-31 survey was previously conducted by TRC across the entire site during the Phase I investigation. This survey located several anomalous areas which were later scheduled for test pit investigations during the Phase II investigation. The Phase II EM-31 survey was designed to confirm the locations of these anomalies prior to the test pit investigations.

The Phase II EM-31 survey was conducted across the central and western mounded sections of the site along a 50-foot grid spacing that was oriented in an east-west direction. The purpose of this survey was to aid in locating any buried anomalies which could represent potential source(s) of the petroleum contamination found in portions of the site during the Phase I RI. Potential sources of the contamination could include buried tanks or drums, or petroleum contaminated soil, all of which could be detected by the EM-31. Figure 2-4 shows the area over which the survey was conducted.

EM-31 readings were recorded at every 50-foot station on the traverses. In addition, EM readings were continuously observed between each of the stations, and any reading that significantly deviated (e.g., negative values) was also recorded. Site features, including chain-link fencing which can cause interference with the EM-31, were also noted.

EM-31 Survey Results

EM-31 readings consisted of elevated values and negative values detected across both of the survey ar as. The results of the Phase II EM survey are contoured on a map of the site on Figure 2-5. North of the central mounded area, EM-31 readings generally increased to over 250 mmhos/m, at the edge of the bank overlooking the water This increase may represent a plume of contaminated groundwater identified in this area during the Phase I RI or an area of salt water intrusion. Along the western side of the central mounded area, sev ral negative values followed by elevated values (over 300 mmhos/m) were recorded within a 50-foot square area. A rectangular-shaped area of distressed vegetation at this location also indicated the possible presence of a steel-reinforced concrete slab just below the surface. This area was later investigated as test pit 1 (TP1) during the test pitting activities and the presence of a concrete slab was confirmed. Other elevated values along the western side of the mounded area are believed to be due to the presence of a storm sewer line running across the site and north to Narragansett Bay. The storm sewer line is a 24-inch steel-reinforced concrete pipe.

The EM-31 survey conducted across the western mounded area resulted in no significant meter fluctuations. The only elevated values were detected on the southern and western sides of the mound, and are believed to reflect the presence of a storm sewer line that cuts across this end of the site.

2.2.1.3 Magnetometer Survey

TRC also conducted a magnetometer survey at the OFFTA site in October 1993. The survey was conducted using a Geometric G-856 proton precession land magnetometer. The magnetometer utilizes the precession of spinning protons of hydrogen atoms in a sample fluid (decane) to measure total magnetic field intensity at a given point. The total magnetic field value measured by the proton precession magnetometer is the net vector sum of the ambient earth's magnetic field, plus any local induced and/or remnant perturbations, such as buried tanks or drums. The magnetic data will also aid in distinguishing any EM-31 anomalies due to ferrous metal from electrically conductive, non-ferrous objects.

Magnetometer Survey Overview

The Phase II magnetometer survey was conducted to further define any EM-31 anomalous areas to determine if buried ferrous metal, or electrically conductive, non-ferrous objects caused the anomalies. It was conducted investigation along the same 50-foot grid spacing across the central and western mounded areas as the EM-31 survey. Magnetometer readings were recorded at each 50-foot station interval. This survey located several anomalies in locations similar to those detected with the EM-31. These results were subsequently used to locate test pits for the Phase II investigation.

Magnetometer Survey Results

The results of the Phase II magnetometer survey are contoured on a map of the site on Figure 2-6. The magnetometer results ranged from 51,934 to 56,106 gammas across the central mounded portion of the site. The greatest variation in sample values occurred southwest of the mound, in the area believed to be underlain by a steel-reinforced cement slab. Within 50 feet, the sample values changed from the lowest to the highest recorded values at the site. This area was subsequently investigated as TP1. Values across the top of the mound and on the north side of the mound did not vary significantly.

The magnetometer survey across the western mounded portion of the site did not detect any significant variations. Readings ranged from 53,916 to 54,432 gammas across this area, with the highest reading being recorded over the sewer outfall pipe on the northern edge of this area and the site.

2.2.2 Phase II Soil Gas Investigation

The objective of the soil gas survey was to investigate potential upgradient contamination observed in the form of SVOCs in soil at an upgradient boring (MW-5) during Phase I exploration activities. The survey also investigated the presence of upgradient subsurface petroleum-related contamination reportedly observed in utility trenches in this area.

Target Environmental Services, Inc. (Target) of Columbia, Maryland performed the soil gas survey on October 19 and 20, 1993. The locations of the soil gas points are provided on Figure 2-7. Although the soil gas sampling team made several attempts, the stony subsurface material at the planned SG-2 soil gas point did not allow for the completion of this point.

Phase II Soil Gas Methodology

The soil gas samples were collected using a truck-mounted hydraulic sampling probe (e.g., Geoprobe ™) which advanced connected 3-foot sections of 1-3/8 inches outside diameter (OD), threaded steel casing to the sampling depth. Each of the soil gas samples collected at the site was collected from a depth of five feet. Once at depth, the casing was hydraulically raised several inches in order to release a disposable drive point and open the bottom of the casing. A Teflon line with a perforated hollow stainless steel probe end was then inserted into the casing to the bottom of the hole, and the bottom-hole line perforations were isolated from the up-hole annulus by an inflatable packer. Following isolation of the sampling zone, a sample of in-situ soil gas was then withdrawn through the probe and used to purge atmospheric air from the sampling system. A second sample of soil gas was then withdrawn through the probe and encapsulated in a pre-evacuated glass vial at two atmospheres of pressure (15 psig). The self sealing vial was detached from the sampling system, packaged, labeled, and stored for laboratory analysis.

Prior to the day's field activities the sampling equipment was decontaminated by washing with soapy water and rinsed thoroughly. Internal surfaces were flushed dry using pre-purified nitrogen or filtered ambient air, and external surfaces were wiped clean using clean paper towels.

All of the soil gas samples collected during the survey were shipped by overnight service to the Target Environmental laboratory for analysis. The samples were analyzed by two methods. One analysis was conducted according to EPA Method 601 (modified) on a gas chromatograph equipped with an electron capture detector (ECD), using a direct injection technique. Specific analytes standardized for this analysis were:

- 1,1-dichloroethene (1,1-DCE)
- trans-1,2-dichloroethene (t1,2-DCE)
- cis-1,2-dichloroethene (c1,2-DCE)
- trichloroethene (TCE)
- tetrachloroethene (PCE)
- chloroform ($CHCl_3$)
- methylene chloride (CH_2Cl_2)
- carbon tetrachloride (CCl_4)
- 1,1-dichloroethane (1,1-DCA)
- 1,1,1-trichloroethane (1,1,1-TCA)
- 1,1,2-trichloroethane (1,1,2-TCA)
- 1,1,2,2-tetrachloroethane (TECA)

The chlorinated hydrocarbons were chosen because of their common usage in industrial solvents, and/or their degradational relationship to commonly used industrial solvents.

The second soil gas analysis was conducted according to EPA Method 602 (modified) on a gas chromatograph equipped with a flame ionization detector (FID), using a direct injection technique. The analytes selected for the standardization in this analysis were:

- benzene
- toluene
- ethylbenzene
- meta- and para-xylene
- ortho-xylene

These compounds were chosen to evaluate the presence of fuel products, or petroleum-based solvents.

The analytical equipment was calibrated using a 3-point instrument-response curve and injection of known concentrations of the target analytes. Retention times of the standards were used to identify the peaks in the chromatograms of the soil gas samples, and their response factors were used to calculate the analyte concentrations.

Total FID volatile values were generated by summing the areas of all integrated chromatogram peaks and calculated using the instrument response factor for toluene. Injection peaks, which also contain the light hydrocarbon methane, were excluded to avoid the skewing of total FID volatile values due to injection disturbances and biogenic methane. For samples with low hydrocarbon concentrations, the calculated total FID volatiles concentration is occasionally lower than the sum of the individual analytes. This is because the response factor used for the total FID volatiles calculation is a constant, whereas the individual analyte response factors are compound specific. It is important to understand that the total FID volatiles levels reported are relative, not absolute values.

Field control samples were collected at the beginning and end of each day's field activities, after every twentieth soil gas sample, and prior to sampling at a new site. These quality assurance/quality control (QA/QC) samples were obtained by inserting the probe tip into a tube flushed by a 20 psi flow of pre-purified nitrogen. Concentrations of all analytes were below the reporting limit in all field control samples, indicating that the QA/QC measures employed in the field were sufficient to prevent cross-contamination of the samples during collection.

A duplicate analysis was performed on every tenth field sample. Laboratory blanks of nitrogen gas were also analyzed after every tenth field sample. Concentrations of all analytes were below the reporting limit in all laboratory blanks and all duplicate analyses were within acceptable limits.

Phase II Soil Gas Results

The soil gas survey results were reported as total FID volatiles, as well as separate breakdowns for the individual compounds. The soil gas survey results are presented in Appendix D, as part of the report from Target Environmental. There were no volatile organic compound concentrations detected in any of the samples via the GC/FID method. Chloroform was detected in soil gas sample FFSG11-5 at a concentration of 1.8 ppb via the GC/ECD method. This was the only soil gas sample collected from this site in Phase II that contained a detectable concentration of VOCs.

The Phase II soil gas survey conducted at OFFTA did not identify the source of the upgradient contamination observed in the form of SVOCs in soil at an upgradient boring (MW-5) during Phase I exploration activities or the source of the subsurface petroleum-related contamination (sheen) reportedly observed in groundwater in utility trenches in this area of the site. Based on the soil gas survey results, none of the planned Phase II well or boring locations required adjustment.

Although there were periods of light rainfall (0.16 inches) on the second day of the soil gas survey, this probably did not have any affect on the survey findings. This is primarily due to the fact that the area over which the soil gas survey was conducted is covered with asphalt which significantly reduces or eliminates any infiltration and saturation of soils in this area. Furthermore, no signs of precipitation infiltration or saturation of soils were observed during the soil gas survey.

It is also important to note that although the soil gas survey did not detect any of the listed VOCs, this does not definitively prove that there is no petroleum-related contamination in the subsurface in the area of the survey. Prior reported observations in the area (e.g., sheen on groundwater in utility trench, petroleum-like odors in manholes) indicate the likely presence of petroleum-related contamination in the area groundwater. However, it is possible that the reported contamination is the result of past releases of fuel oil or petroleum product that originally had a low percentage of VOCs (those detected by soil gas measurements) or that any VOCs previously present in the product may have since either degraded or volatilized to nondetectable levels in the soil gas.

2.2.3 Phase II Surface Soil Investigation

Surface soil sampling was conducted under the Phase II field investigation to further evaluate the presence, nature, and extent of surface soil contamination detected during the Phase I investigation. This section presents an overview of the surface soil investigation and a summary of the field measurements and observations made during the sampling activities. Analytical data for surface soil samples are discussed in Section 4.0.

Overview of Phase II Surface Soil Investigation

During the Phase II investigation, 20 surface soil samples (SS-12 through SS-31) were collected and analyzed for the full TCL and the TAL parameters. Three of these samples (SS-29, SS-30, and SS-31) were collected as background samples from a park located to the southeast of the site. The locations of the Phase II surface soil samples are shown on Figure 2-8.

The surface soil samples were collected with a dedicated, decontaminated, stainless-steel spoon. Surface soil samples were collected from within the 0- to 1-foot horizon to be consistent with EPA risk assessment protocol for characterizing surface soil. Soil samples collected for VOC analysis were collected from 6 to 12 inches bgs and were transferred directly to the sample container, in order to minimize loss of VOCs from the sample. Soils for the remaining analyses were collected from 0 to 3 inches bgs, homogenized in a stainless-steel bowl, and placed into the appropriate sample containers.

In addition to the 20 surface soil samples discussed above, 17 test boring/monitoring well boring surface soil samples (0-1 foot sample interval) were also collected and analyzed for full TCL/TAL parameters. These samples were collected from 11 soil borings (B-08 to B-18) and 6 monitoring well borings (MW-6 to MW-11). The locations of these soil borings and monitoring wells are shown on Figures 2-9 and 2-10, respectively.

Phase II Surface Soil Investigation Field Measurements and Observations

A description of each of the Phase II surface soil samples and first interval test boring/monitoring well boring samples was recorded in a field notebook. Soil descriptions from the surface soil sample logs are presented in Table 2-3.

The OFFTA site surface soils primarily consisted of a brown fine sand and silt, with varying amounts of medium sand, gravel, rock fragments, and organics. Those surface soil samples collected from the central and western mounded areas of the site (SS-19, SS-25, SS-26, B08-1, B09-1, B10-1, B14-1, and B15-1) contained varying amounts of fill material (i.e., brick, asphalt, concrete, etc.). In addition, several samples (SS-20, SS-21, SS-22, B-13, M-10, and M-11) which were completed along the central and western bank at the shoreline also contained varying amounts of fill material. No odors were noted in any of the surface soil samples collected at the site.

2.2.4 Phase II Subsurface Soil Investigation

The following sections present details of the soil boring and test pit investigations conducted during the Phase II RI to characterize subsurface soils.

2.2.4.1 S il B ring Investigation

A subsurface soil investigation was conducted at the OFFTA site by drilling and sampling soil borings to characterize the soil and to determine the extent of the subsurface soil contamination detected during the Phase I investigation. This section of the report includes an overview of the test boring investigations and a summary of the field measurements and observations made during the drilling activities. A description of the site geology based on the data collected during the Phase II investigation is provided in Section 3.2.2. Analytical data for subsurface soil samples are discussed in Section 4.0.

Overview of Phase II Soil Boring Investigation

A total of eleven (11) test borings (B-8 to B-18) were drilled and sampled across the site to characterize the nature and extent of the subsurface soil material. In addition, soil samples were collected from five (5) on-site monitoring well borings (MW-7 to MW-11) and one (1) off-site monitoring well boring (MW-6). The Phas II RI test borings and monitoring well borings locations are shown on Figures 2-9 and 2-10, respectively. Phase II boring logs are presented in Appendix F.

During the Phase II investigation, continuous split-spoon soil sampling was conducted at each of the test borings and several of the monitoring well borings until the bedrock surface was encountered or beyond any observed fill material. Bedrock was present at depths ranging from two to twenty-nine feet below grade. Hollow-stem augering was continued into the weathered bedrock zone at several of the test and well boring locations. In the case of well boring MW-6R, augering was continued to a depth of 21 feet below the weathered bedrock surface without encountering highly competent bedrock. In several cases (MW-8R, MW-9R, MW-11R) the bedrock surface was encountered at or just below the water table, requiring the installation of bedrock wells rather than shallow wells. For these wells, hollow-stem augering was unable to advance the borehole through the bedrock, so an air-rotary drill rig with an air hammer was used to drill through the bedrock and set the wells. The monitoring well borings for each well installed in the bedrock were completed to a depth necessary for the installation of a bedrock well.

The physical characteristics of each soil sample were geologically logged and described in a field notebook. In addition, general observations such as staining, odors, and fill material were also described in the field notebook. Each split-spoon sample was also screened for the presence of VOCs using an Organic Vapor Analyzer (OVA) FID and/or an HNu photoionization detector (PID).

A total of one to three soil samples were collected for full TCL/TAL analyses from each of the eleven test borings and six monitoring well borings completed during the Phase II RI. Soil samples were generally collected from the 0- to 2-foot interval (0- to 1-foot portion for analyses as surface soil) and from the last sample interval just above the groundwater table. A third sample was also collected at those locations where potential contamination (e.g., oil, stains, odors) was observed above the water table. The selection of which split-spoon samples were to be submitted for analyses was also constrained by the amount of sample material recovered by each split spoon. A total of thirteen (13) subsurface soil samples were collected for full TCL/TAL analyses, and two (2) subsurface soil sample were collected for TCL VOC analyses. Partial analyses were conducted at these two locations because the split-spoon sample recovered too little soil for any other analysis. Three subsurface soil samples were also collected from beneath the groundwater table (i.e., in the saturated zone) and analyzed for total organic carbon (TOC), cation exchange capacity, and grain size to aid in evaluating contaminant transport issues at the site. Results of these analyses are provided in Appendix G.

Phase II Soil Boring Investigation Field Measurements and Observations

During the Phase II soil boring drilling and sampling investigation, all of the field measurements and observations were recorded in a field notebook. Recorded field measurements included organic vapor measurements made with an OVA FID and/or HNu PID and combustible gas (or LEL) readings. Observations that were recorded in the field included geologic soil descriptions and visual signs of potential contamination (i.e., discolored soils, waste products, odors, etc.). All of the Phase II soil boring drilling measurements and observations are presented in the soil boring logs and well boring logs in Appendix F.

Fill materials consisting of construction debris (i.e., concrete, asphalt, bricks, wood) were encountered in borings completed in the central and western mounded areas of the site. Borings were completed through these mounded areas to characterize the types of material present. Borings B-14 and B-15, completed through the central mounded area, encountered fill material to depths of 23 and 20 feet below grade, respectively. Observations in both borings indicate that the fill material was deposited directly on top of the bedrock surface. No volatile organic gas readings were detected in either of these borings, and only the 10- to 12-foot interval from B-15 was noted to have a petroleum odor.

Four borings were completed in the western mounded areas of the site. Borings B-8 and B-9 were completed on the large mounded area just west of the baseball field, while B-10 was completed on another smaller mound located farther to the west. Boring B-11 was completed between the two mounded areas, adjacent to the parking area. All four borings completed in this area encountered construction fill materials similar to those found in the central mounded area. The thickness of the fill materials ranged from 4 feet in boring B-11, to ov r 14 feet in boring B-9. Borings B-9 and B-10 were not completed through the fill material due to auger refusals caused by subsurface debris (e.g., concrete, asphalt). Petroleum odors and visible staining were noted in soils collected below the water table at boring B-8, with low volatile organic gas readings of 28 ppm and 20 ppm detected with an OVA and HNu, respectively. No volatile organics gas readings, odors, or petroleum staining were noted in any of the other three borings completed in this area.

Construction-type fill material was also encountered in several of the test and well borings completed along the shoreline in the central portion of the site. Fill materials encountered in this area, where present, ranged in thickness from 2 feet (MW-2 and MW-10) to over 10 feet (MW-11). No fill materials were encountered at borings B-12 or B-16. All of the borings completed in this area exhibited signs of petroleum staining and/or odors at intervals just at or below the groundwater table. Volatile organic gas readings ranged from not detected to over 1,000 ppm with an OVA. HNu readings were typically lower than those obtained with the OVA The highest volatile organic gas readings were detected in a peat layer, which was present in borings MW-2 and B-13. The lower HNu PID readings from this zone indicated that the volatile gas readings in this layer were likely methane resulting from the decomposition of the organic peat material.

Borings completed on the eastern portion of the site did not encounter any fill materials. Soils consisting of a fine sand, with some silt and gravel were encountered at all three test and well boring locations completed in this area. Competent bedrock was also encountered at each location, at depths ranging from 2 feet (B-18) to 6 feet (MW-8) below grade. Boring B-17, completed within the playground at the child day care center, also did not encounter any fill material. Bedrock was encountered at 5 feet below grade, and was overlain by a fine to coarse sand/gravel soil layer at this location. Bedrock was encountered before the groundwater table at two wells, MW-8 and MW-9. No volatile organic gas readings were detected in any of these borings, and no signs or odors of petroleum contamination were observed.

As indicated above, several of the soil borings and monitoring well borings completed at the site during the two RI phases exhibited signs of petroleum contamination (i.e., stained soils, odors) from soils at or below the groundwater table. Soil and monitoring well boring soil samples that contained petroleum odors were located in the central to western portions of the site, from Taylor Drive to Narragansett Bay. Those soil and monitoring well borings that exhibited visual signs of petroleum staining were primarily located in the northern portion of the site. Additional details of observed petroleum contamination are provided in Section 4.0.

2.2.4.2 Test Pit Investigation

Test pit investigations and sampling were conducted in the central portion of the site to characterize the soil mounds and to investigate significant geophysical anomalies identified at the site during the Phase I investigation. Results of the geophysical surveys conducted during the Phase II investigation were used to relocate and further define the extent of the anomalies and to determine the final locations of the Phase II test pits. As approved by the EPA and RIDEM, the test pit planned for the western edge of the site was not completed because it was determined in Phase II that the geophysical anomaly at this location resulted from a buried storm sewer pipe. In addition, as discussed with the EPA and RIDEM, the test pit planned for the middle of the central mound was moved to the western bottom edge of the mound and two borings were instead completed on top of the mound.

Overview of Test Pit Investigation

A total of three test pits were excavated at the site during the Phase II investigation. Test pits were excavated to a maximum depth of the groundwater table (approximately 4 to 5 feet below grade at TP1, and approximately 8 to 8.5 feet below grade at TP2 and TP3) using a backhoe. The soils and fill material encountered in the test pits as well as the size of the test pit and depth to groundwater were recorded in a field notebook. The test pits/trenches were approximately 4 feet wide and ranged from 7 to 15 feet long. Test pit logs are presented in Appendix F. At the completion of test pit excavations, the excavated material was returned to the excavation, compacted and covered using polyethylene sheeting. The test pit locations were subsequently regraded with clean top soil and revegetated with grass. The locations of the three test pits are provided in Figure 2-11.

Three soil samples were collected from each of the test pit excavations in order to characterize the material encountered. Soil samples were collected directly from the sidewalls of the test pit or from soils in the backhoe bucket using a dedicated, decontaminated stainless-steel spoon and bowl. Each soil sample was analyzed for the full list of TCL/TAL parameters. The third sample collected from test pit TP1 was a sample of an oily sludge encountered in a buried clay pipe, which was encountered during the excavation activities. The sludge sample was analyzed for the full list of TCL/TAL parameters and was also submitted for a GC petroleum fingerprint. Prior to backfilling the test pit, the pipe was plugged using absorbent pads to prevent the oily sludge from exiting the pipe. The RIDEM also collected soil samples for each of the test pits and the pipe for additional laboratory analyses. Analytical data for the test pit soil samples are discussed in Section 4.0.

Test Pit Investigation Field Measurements and Observations

All of the field measurements and observations were recorded in a field notebook during the test pit investigation actvities. Recorded field measurements included OVA instrument readings. Observations that were recorded included geological soil descriptions and visual observations (e.g., debris, waste, discolored soils). All of the test pit measurements and observations are presented as test pit logs located in Appendix F.

The fill material encountered in the three test pits primarily consisted of fine-to-medium sand and construction/demolition debris, including brick, concrete, and asphalt fragments. This debris material was intermixed with soil in each of the test pits at depths ranging from 4 inches (to the top of the cement slab) to 7 feet below grade.

Three separate areas were investigated at test pit TP1 in order to determine the source of the significant geophysical anomaly detected during the Phase I investigation. The test pit excavations indicate that the source of the anomaly appears to be a 2-foot thick concrete slab that was encountered at each location at a depth of approximately 4 inches below grade. The edge of the concrete slab was identified in test pits TP1A and TP1C.

The edge of the concrete slab coincides with the location of the building shown on this portion of the site in the 1944 aerial photograph (Figure 1-6). The material encountered beyond the extent of the concrete slab consisted of brown medium to fine sand with some cobble and rock fragments, and brick and concrete fragments. The groundwater table was encountered at a depth of approximately 5 feet below grade. A 4-inch clay pipe was observed at the ends of test pits TP1A and TP1C at a depth of 4 feet. The pipe was observed to contain approximately 1 inch of a black oily sludge material on its bottom. The sludge was sampled and the ends of the pipes were plugged with absorbent pads prior to backfilling in order to prevent the material from exiting the pipe.

The subsurface conditions encountered at test pit TP2 consisted of various amounts of sand, cobbles, rock fragments, brick, concrete, and asphalt from the surface to a depth of approximately 7 feet. The material encountered in the 7- to 8-foot layer consisted of sand with cobbles and rock fragments. A strong petroleum odor and staining was observed in the soils located at the approximate depth of the groundwater table (approximately 8 feet below grade).

Subsurface conditions at test pit TP-3 consisted of an upper 4-foot layer of sand, rock fragments, brick, concrete, and wood, followed by a 0.5-foot asphalt layer, 2.5 feet of dark brown sand, rock fragments, brick and metal, and one foot of light brown sand with rusted metal pieces. The soils collected from the last backhoe bucket (approximately 8 to 8.5 feet below grade) contained black stained soils with a strong petroleum odor. These soils were located at the approximate depth of the groundwater table.

2.2.5 Phase II Groundwater Investigation

A groundwater investigation was conducted at the OFFTA site to further investigate the nature and extent of groundwater contamination, as well as to provide information on the hydrogeology at the site. The following sections provide an overview of the groundwater investigation, a summary of the Phase II monitoring well installation methods and well construction details, a summary of the Phase II groundwater sampling methodology, and a summary of the field measurements and observations associated with the groundwater investigation conducted at the site. A description of the site hydrogeology based on the data collected during the Phase II investigation is provided in Section 3.3.6. The Phase II RI soil boring and well boring logs are presented in Appendix F; slug test data is presented in Appendix I. A detailed evaluation of groundwater analytical data is presented in Section 4.0.

Previous groundwater investigations conducted at the site included the installation of five monitoring wells (MW-1 through MW-5) during the Phase I RI. Figure 2-1 provides the locations of the Phase I groundwater monitoring wells. Although ten monitoring wells were planned at the site under the Phase II Work Plan, only nine wells were installed because the groundwater was not within the overburden materials at a planned shallow overburden well location (MW-9). However, the bedrock well also planned at this location was installed. Figure 2-10 shows the locations of the Phase II groundwater monitoring wells.

Overview of Phase II Groundwater Investigation

The Phase II RI groundwater investigation included the installation of four shallow monitoring wells (MW-6S, MW-7S, MW-10S, and MW-11S) screened across the groundwater table in the overburden material, one deep monitoring well (MW-2D) screened above the bedrock surface, and four bedrock wells (MW-6R, MW-8R, MW-9R, and MW-11R) screened entirely within the bedrock material. Monitoring wells MW-8R and MW-9R are screened across the water table in the bedrock.

Each of the Phase II monitoring wells, with the exception of wells MW-8R, MW-9R, and MW-11R, was installed using standard 4-1/4 inches I.D. hollow-stem auger drilling techniques. Due to the presence of a hard conglomerate bedrock at this site, air rotary drilling techniques were required for the installation of monitoring wells MW-8R, MW-9R, and MW-11R. As previously mentioned in Section 2.2.4.1, continuous split spoon sampling was conducted in all of the well borings to the depth of the bedrock or beyond any observed fill material. Soil samples submitted for laboratory analyses were transferred from the split spoon directly into the appropriate sample containers with a dedicated stainless steel spoon. Each split spoon was monitored using an OVA and/or HNu and all field observations and measurements were recorded in a field notebook. Well boring drill cuttings were contained in labeled, DOT-approved 55-gallon drums at each well location.

Monitoring wells were constructed in accordance with the approved Phase II Field Sampling Plan (TRC, 1993). Each well was constructed of 2-inches inside-diameter (I.D.), flush-threaded, Schedule 40 PVC riser and 10-slot (0.010 inch) PVC screen. All of the monitoring wells were constructed using ten (10) feet of screen, with the exception of monitoring wells MW-6S, MW-11S, and MW-11R, which were constructed using five (5) feet of screen due to the subsurface conditions. Additionally, monitoring well MW-10S was constructed using eight (8) feet of screen, due to bedrock refusal. The well annulus was backfilled with a silica (quartz) sand filter-pack to at least 1 foot above the top of the well screen and a 1- to 2-foot thick bentonite seal was placed above the sand pack. A portland cement/bentonite slurry grout was placed in the well annulus from the top of the bentonite seal to the ground surface. A steel flush-mount casing with a locking cap was securely set in the cement over the well riser.

As is specified in the approved Phase II RI/FS Work Plan, the specifications for the monitoring well screen slot size and sand pack was that "the well screen slot size shall retain at least 90% of the grain size of the filter pack". This requirement is consistent with the State of Rhode Island Groundwater Quality Regulations. The screen slot size used for all of the wells installed at the site is a No. 10 (0.01 inch). The sand pack used in these wells is a uniform No. 1 sand which has an effective grain size (D10 = 10% passing or 90% retained) of approximately 0.035 inches. No. 10 screen size retains at least 90% of the grain size of a uniform filter pack sand.

It is important to note that much of the commonly used sand pack sizing criteria have primarily been developed for water supply wells or wells which are to be installed in uniform water-bearing geologic materials that are considered to be aquifers (i.e., water bearing units that yield significant quantities of water to wells). It is apparent that the fill materials in which the wells are installed on the site should not be considered aquifers. In addition, the results of grain size analysis of site formation samples (see Appendix G) indicate that the formation materials are not very uniform (uniformity coefficients all over 100) and include a significant percentage of fines. Thus, although an attempt was made to install wells from which representative, sediment-free groundwater samples could be collected, there are no defined well design criteria which would have assured truly sediment-free or low turbidity groundwater in the wells at this site.

Each of the monitoring wells installed during the Phase II RI was developed using a centrifugal pump. During the development of each well, water quality parameters including pH, conductivity, temperature, and turbidity were monitored. The goals of the well development program were to remove fine-grained sediments from the vicinity of the well screen until the water attained visual clarity and/or until the water quality param ters equilibrated. Due to the fine-grained geologic material around many of the monitoring well screens, visual clarity of the well water was not attainable at every location. Generally, each monitoring well was pumped for a minimum of one hour. Continuous pumping was attainable at all of the monitoring wells, with the exception of well MW-6S. Table 2-4 provides all of the Phase II well development data for the site. All water produced during well development activities was contained in 55-gallon drums and appropriately labeled.

Groundwater samples were collected from the fourteen monitoring wells installed during the Phase I and Phase II RI. Groundwater sampling was conducted on January 4-6, 1994, approximately two and one-half weeks following Phase II well development.

Prior to initiating sampling activities the groundwater level of each monitoring well was measured to the nearest 0.01 foot using an electric water sensing device. These water levels are presented and discussed in S ction 3.3.6. The water level indicator and probe were decontaminated before each use with a tap-water/non-phosphate detergent wash and a distilled/deionized water rinse. Additionally, an oil/water interface probe was used at several of the wells (MW-2S, MW-2D, MW-3S, MW-10S, MW-11S, and MW-11D) where the presence of volatile organics or a non-aqueous phase liquid (NAPL) was suspected. The entire water column in the tested wells was monitored with an oil/water interface probe for the presence of separate phase petroleum products, including both light non-aqueous phase liquids (LNAPLs) or "floaters" and dense non-aqueous phase liquids (DNAPLs) or "sinkers". No NAPLs were encountered in any of the wells during the Phase II RI.

Prior to the groundwater sampling, a minimum of three well volumes was purged from each well using a dedicated/decontaminated Teflon bailer. A Teflon leader-line approximately 3-feet in length was attached to the end of the bailer and a polyethylene coated nylon rope was attached to the Teflon line and used to lower and raise the bailer in the monitoring well. The groundwater extracted from the well was continually monitored for pH, temperature, specific conductance, and turbidity. Purging of the groundwater was continued until the pH, temperature, specific conductance and turbidity stabilized to ± 10% on successive well volumes. Groundwater samples were collected using the same bailer used to purge the well. The groundwater sample was collected by slowly lowering the bailer into the well until the bailer was filled with water. Once filled, the bailer was raised to the surface where the groundwater was transferred into the appropriate sample container. In general, the monitoring wells were sampled for full TCL/TAL and total chloride. In addition to the above analyses, monitoring wells MW-2S, MW-2D, MW-4S, MW-7S, and MW-8R were also analyzed for biological oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids (TSS), and dissolved metals (filtered) for groundwater treatability information. Groundwater samples which were to be analyzed for dissolved metals were field filtered through a Ready-Flow™ high capacity 0.45um in-line disposable filter immediately following collection. Each sample was labeled according to the procedures described in the Phase II RI Work Plan and placed into an iced cooler prior to shipment to Weston Analytical Laboratories.

Phase II Groundwater Investigation Field Measurements and Observations

Several field measurements were collected as part of the site groundwater investigation. These measurements included periodic water level measurements of site wells and the pH, specific conductance, Eh, temperature, turbidity, dissolved oxygen, and salinity of each groundwater sample. All field measurements and notable observations made during groundwater sampling were recorded in the field notebook and are discussed below. The Phase II RI soil boring and well boring logs are presented in Appendix F.

The groundwater levels were measured in each of the monitoring wells on January 4, 1994, February 22, 1994, May 12, 1994, and July 12, 1994 with an electric water sensing device. Depths to the groundwater table ranged from approximately 4 feet near the northern shoreline to 8 feet below grade at the southern, upgradient area. A complete discussion of the periodic groundwater level measurement results is presented in Section 3.3.6.

The groundwater field parameters pH, specific conductance, Eh, temperature, turbidity, dissolved oxygen, and salinity were measured prior to groundwater sample collection at each well and are provided in Table 2-5. The pH of the groundwater samples ranged from 4.54 (MW-7S) to 7.79 (MW-2D). The average on-site pH level of 6.8 is consistent with those values measured in the three off-site wells. The reason for the lower pH value of 4.54 at well MW-7S is unknown. The temperature of the groundwater from each well ranged from 5.2 °C (MW-11S) to 14.6 °C (MW-5S). Overall, the average on-site groundwater temperature was approximately 9.7 C. The reason for the observed temperature variations at wells MW-5S, MW-6R, and MW-11S is unknown.

The specific conductance of the groundwater samples ranged from 0.571 (MW-6R) to 23.3 (MW-2S) mmhos/cm. As indicated by these extremes and the other groundwater conductivity data, the conductivity values are generally greatest along the site's shoreline. This finding is consistent with other site groundwater data (e.g., salinity, chloride) which indicates the influence of salt water intrusion from the adjacent harbor and bay. Turbidity values of the groundwater samples ranged from 110 NTUs to greater than 1,000 NTUs, with many of the samples observed to contain a fine dark brown or grey silt. Dissolved oxygen readings measured in the groundwater ranged from 1.57 (MW-7S) to 4.99 (MW-6R and MW-11R) mg/L, with no trends evident in the measured values. Groundwater salinity values ranged from 0.02% (MW-5S and MW-6R) to 1.39% (MW-2S), with the greatest salinity values being measured in the shoreline wells. Measured oxidation/reduction potential (Eh) values ranged from 129.0 (MW-11S) to 266.4 (MW-7S) mV, with the lowest values or more reducing conditions typically measured along the shoreline. The clarity of the groundwater samples collected from the site varied greatly.

Observations made during the groundwater sampling event included any unusual appearances or odor of the groundwater. These observations were recorded in the field notebook. A petroleum-like odor was noted in monitoring wells MW-3S, MW-4S, and MW-2S located in the central and western areas of the site. In addition, the groundwater from monitoring wells MW-11S and MW-10S, located west and east of the central site area, was noted as having a slight sheen as well as a noticeable petroleum odor. Although several small oil globules were once observed in Phase I on a water level measurement device used in well MW-2S, no measurable layer of oil was detected in any of these wells with an oil/water interface probe.

A licensed State of Rhode Island surveyor surveyed the elevation and location of each of the groundwater monitoring wells in reference to the Rhode Island Grid System. The elevations of the top of the PVC inner well casing and the ground adjacent to the well were surveyed to the nearest one hundredth of a foot (0.01 feet). All of the well coordinates and elevations are provided in Table 2-6.

2.2.5.1 Hydraulic Testing

After the completion of the groundwater sampling at the site, single well hydraulic conductivity tests (slug tests) were performed at several of the site monitoring wells. The hydraulic conductivity estimates obtained from the slug test analysis were used along with site hydraulic gradients and estimated site porosity values to calculate horizontal groundwater flow velocities. Hydraulic gradients, site porosities, and horizontal velocities are discussed in Section 3.3.6.

A slug extraction test (rising head slug test) estimates the hydraulic conductivity or transmissivity of an aquifer from the rate of rise of the water level in a well after a certain volume or "slug" is suddenly removed from the well. Rising head slug tests were conducted at the site on January 7, 1994 at three shallow monitoring wells

(MW-2S, MW-7S, and MW-11S), the one deep monitoring well (MW-2D), and three bedrock wells (MW-6R, MW-8R, and MW-11R). On July 13, 1994, additional slug tests were conducted on wells MW-4S, MW-9R, and MW-10R. At each well, a pressure transducer connected to an In-Situ, Inc., Hermit 1000 electronic data logger was lowered several feet into the water and the cable secured to the top of the well. One or two closed five-foot, sand filled PVC cylinders were submerged in the well to displace a portion of the water column. After the water level reached equilibrium, the cylinder(s) were rapidly pulled out to produce an instantaneous drop in hydraulic head. The piezometric response was recorded at the data logger according to a preprogrammed logarithmic schedule until the water level re-equilibrated, or up to a total elapsed time of one hour, whichever came first. The logarithmic schedule results in one reading every 0.20 seconds for the first 20 seconds, one reading per second for the next 40 seconds, one reading every 12 seconds for 1 to 10 minutes, and one reading every 2 minutes for 10 to 100 minutes of test time.

In addition to slug extraction (rising head) tests, one slug injection (falling head) test was conducted in monitoring well MW-11R. The slug injection test was conducted by pouring a volume of water into the monitoring well to increase the hydraulic head in the well to above the top of the screen. The hydraulic conductivity or transmissivity of the aquifer was then estimated from the rate of fall of the water level in the well. As with the slug extraction tests, a pressure transducer was connected to an In-Situ, Inc., Hermit 1000 electronic data logger and lowered several feet into the water and the cable secured to the top of the well. Once the transducer was set up, 5 gallons of water were poured into the well and the test was begun. Due to the small diameter of the monitoring well, approximately one minute elapsed between the start and completion of the injection of water into the well. Therefore, to accurately analyze the results from this test, time zero was adjusted to reflect the highest head obtained, which coincided with the end of the water injection.

The slug test data was analyzed using SLUGIX™ (Interpex Limited, 1988), an interactive computer slug test analysis program, using the option for the Bouwer and Rice (1976) method for completely or partially penetrating wells in unconfined aquifers. Using this method, the hydraulic conductivity and transmissivity of the aquifer near each well were calculated. The results of the slug tests are discussed in Section 3.3.6 of this report.

2.2.6 Phase II Storm Water Sewer Investigation

Storm sewer samples were collected from the drainage network at the site to investigate an oily sheen that was reportedly observed on the effluent at the outfall pipe into Coasters Harbor.

Overview of Phase II Storm Water Sewer Investigation

Two samples were collected from the site drainage network. One sample (ST-1) was collected from a catch basin upgradient of the site along Taylor Drive, to assess the quality of the storm sewer water upgradient of the site. The second sample (ST-2) was collected from the sewer pipe outfall into Narragansett Bay. The two storm sewer samples were collected while the sewer water was flowing on December 6, 1993, following significant rainfall the previous day. The samples were submitted for full TCL/TAL analyses. Field measurements including pH, specific conductivity, and temperature were conducted on each of the samples at the time of collection. The location of the two storm sewer samples is shown on Figure 2-12 and the field measurement parameters are provided in Table 2-7.

Phase II Storm Water Sewer Investigation Field Measurements and Observations

Field measurements and observations of the storm water samples included a physical description (i.e., odors, sheen) of the samples as well as field measurements, including pH, specific conductance, and temperature. Field measurements and observations of the storm water samples were recorded in the field notebook at the time of sampling and are discussed below.

During sample collection, a visible sheen was noted in the storm water flowing through the catch basin located on Taylor Drive. In addition, a strong petroleum odor was also noted in the catch basin at the time of sample collection (ST-1). No visible contamination was noted in the outfall sample (ST-2); however, assorted solid material was observed present along the bottom of the outfall pipe at the time of sampling. This material included sand and gravel, as well as asphalt fragments. This material is characteristic of the shoreline sediments and may have been washed from the shoreline into the drain pipe due to tidal action. At periods of high tide, this outfall pipe is entirely submerged in sea water, making it easy for sediment to be carried into the pipe from the shoreline. As discussed elsewhere in this report, large amounts of asphalt debris are dispersed along the site's shoreline. The asphalt fragments observed in the pipe may also be from the storm water runoff carried by the pipe from upgradient asphalt roads and parking lots.

The pH values of storm water samples ST-1 and ST-2 were 6.98 and 7.08, respectively, while conductivity values were 0.58 mmhos/cm and 6.32 mmhos/cm, respectively. The elevated conductivity value observed in sample ST-2 may indicate that the salt water from the harbor was still flowing out of the storm pipe and present the storm water sample.

2.3 SOURCE REMOVAL EVALUATION INVESTIGATION

This section summarizes the field investigation activities and findings of the Source Removal Evaluation (SRE) conducted by B&RE (now TtNUS) in 1997 and 1998. Refer to the Source Removal Evaluation Report (B&RE, 1998) for a more comprehensive discussion of the investigation activities and results. The purpose of the source removal evaluation was to locate potential discrete contaminant sources, if present at the site, and determine whether site conditions warranted a removal action to protect public health, welfare, or the environment. In particular, this investigation was conducted in an effort to locate and determine impacts from defunct underground oil and fuel storage tanks and piping, subsurface drains, asphaltic materials eroding along the shoreline that may enter Narragansett Bay, and free product (petroleum hydrocarbons). The investigation also provided supplemental data for this RI.

The SRE investigation did not identify any discrete contaminant sources and found that while there is pervasive petroleum contamination in the subsurface soils, it does appear to be migrating. The SRE concluded that a removal action was not warranted at the OFFTA site.

The investigation activities were conducted by B&RE in June and July 1997 and included a metal and buried piping survey, subsurface soil investigation, groundwater investigation, shoreline sediment investigation, and storm sewer outfall investigation. These elements are described in the Sections 2.3.1 through 2.3.5 and pertinent information obtained from the source removal evaluation is incorporated into the overall RI evaluations presented in the balance of this report.

2.3.1 Metal and Buried Piping Survey

Based on site drawings and aerial photographs, probable locations of subsurface contaminant sources were surveyed with a magnetic metal locator to mark the potential locations of buried piping, underground storage tanks (USTs), and an oil-water separator associated with former OFFTA activities. Based on a 1953 Area Development Plan for Steam and Return Fuel on Coasters Harbor Island (Bureau of Yards and Docks Drawing No. 637871), potential locations of five former USTs, former circular open fire tanks, former Buildings 132 through 135, and an oil-water separator were measured from Building 144 and its immediate vicinity using a transit level. These primary areas of interest were marked and the ground re-surveyed with the metal pipe and cable locator.

Multiple areas of strong signals were identified and marked. Strong signals, registered in proximity to the potential subsurface features, were investigated during the test pit excavation program.

2.3.2 Subsurface Soil Investigation

A subsurface soil investigation was completed and included test pits, soil borings, and associated soil samples addressed below.

2.3.2.1 Test Pit Excavations

Test pit excavations were conducted at selected locations to evaluate the potential presence of subsurface features identified during the metal detection survey, to perform a limited assessment of the central mound immediately north of Building 144, and to characterize select portions of the OFFTA site.

Overview of SRE Test Pit Investigation

Seventeen test pits were excavated using a CAT 311 hydraulic excavator with support from a backhoe. Test pit locations are shown on Figure 2-13. All test pit measurements and observations were recorded on test pit logs, as presented in Appendix O. The dimensions of the test pits/trenches were approximately 4-feet wide and 10- to 31-feet long. Test pit depth was based on specific conditions encountered at each location. Although attempts were made to excavate to the groundwater table at all test pit locations, bedrock refusal or the presence of construction debris in several test pits (TP-01 through TP-03 and TP-06 through TP-10) precluded further excavation in these areas. At test pit TP-04, excavation was halted due to the presence of potentially asbestos-containing material. The material appeared to be pipe-insulation material based on visual observation. Since the field team was not equipped to sample or handle asbestos materials no sample for asbestos analysis was collected and the test pit excavation was backfilled to avoid further disturbance of th potentially asbestos containing material. In test pit TP-12, a buried clay pipe was encountered and broken during excavation activities. (The sample collected from the broken pipe is discussed in the SRE Test Pit Sampling discussion below.) When encountered, small metal debris in the test pits was placed to the sid of the excavation as the excavations progressed. Attempts were made to describe but not disturb larger pieces of buried piping.

Each test pit was documented through photographs and videotape. At the end of each day, all but the top 12 inches of excavated material was returned to the excavation and compacted; clean top soil was added, graded to ground surface, and seeded; and the location was staked for survey purposes.

SRE Test Pit Sampling

Soil samples were collected from each test pit excavation, with the exception of test pits TP-01, TP-03, TP-09, and TP-10. In test pit TP-01, a 4- to 6 inch-thick layer of asphalt pavement was underlain by a gravely sand, and a conglomerate bedrock approximately 1 foot bgs. Soil samples were not collected at this location because no visual observations of contaminants were made. In test pits TP-03 and TP-09, soil samples were not collected because bedrock was encountered approximately 3 feet bgs in each test pit, and no target features or visual contaminants were identified. In test pit TP-10, refusal (a concrete surface with exposed rebar) was encountered at 9-inches bgs.

Soil samples were collected in the immediate vicinity of a target feature (buried piping, etc.), directly from a sidewall of the test pit, or from the excavator bucket using decontaminated stainless steel trowels, bowls, and disposable, sterile scoopulas. Each soil sample was analyzed for TCL organics, TAL metals, and total petroleum hydrocarbons (TPH). Analytical results are discussed in Section 4.0 and the data are presented in Appendix P.

At the request of the RIDEM representative, aqueous samples were collected from three test pits (TP-13, TP-14, and TP-15) for TPH analysis. These samples were lost because of an accident at the laboratory during sample preparation/extraction when the sample containers were broken. In addition, an aqueous sample was collected from TP-12 after a clay pipe was broken during excavation. The material that discharged from the pipe was mostly water with a sheen. However, the laboratory determined that too little non-aqueous mat rial was present in the sample to permit analysis.

2.3.2.2 Soil Boring Investigation

Two soil borings were advanced to investigate the presence of contaminant sources and to supplement characterization of the site stratigraphy. Borehole locations are presented on Figure 2-13 as MW-101 (SB-1) and MW-102 (SB-2). The soil boring locations were selected based on observations made during test pit excavations and the lack of existing monitoring wells in the central portion of the site. All soil boring observations were recorded on boring logs, as presented in Appendix O.

Each subsurface soil boring was advanced using nominal 4-inches inside diameter, flush joint, temporary steel casing and standard drive and wash drilling methods. A 24-inches long split-barrel sampler with a nominal outside diameter of 3 inches was used to collect samples continuously from the ground surface to refusal. The 3-inch diameter sampler was selected to maximize the probability of collecting a sufficient volume of subsurface soil for sample volume requirements. Standard penetration tests were not conducted (as this requires the use of 2-inch outside diameter samplers); however, blow counts were recorded for each 6-inch interval penetrated.

The physical characteristics of each soil sample were described using the Unified Soil Classification System (USCS) and recorded on boring logs, presented in Appendix O. In addition to sample characteristics, other pertinent observations such as water levels, sample moisture, depth changes in lithology, FID readings, fill material, and the presence of any staining, and visual contaminants or odors were recorded on the boring log. General observations such as sample number, type, time, and depth, sample interval and recovery, and drilling and sampling equipment and methods used were also recorded on each boring log. As each split-barrel sampler was opened, the soils were monitored for organic vapors using a FID. A portion of the soil was initially removed and containerized for VOC analysis; the remaining material was homogenized in a stainless steel bowl and containerized for the other analyses. Soil boring cuttings were contained in a labeled DOT-approved 55-gallon drum.

One soil sample from each boring was selected and shipped to an off-site laboratory for TCL VOC, SVOC, and pesticides/PCBs analysis and total TAL metals and TPH analysis. Sample selection was based on the presence of visual observations of oil-like residues and field screening results; the sample at each location containing the highest FID results or strongest evidence of oil staining was sent for laboratory analysis.

2.3.3 Groundwater Investigation

Two monitoring wells were installed, developed, and sampled in addition to the 13 existing monitoring wells.

2.3.3.1 Monitoring Well Installation

The SRE included installation of two shallow groundwater monitoring wells (MW-101 and MW-102) screened across the water table in the overburden. The objectives of these wells were to supplement the existing well network so that current groundwater contaminant conditions and elevations could be better evaluated, and potential sources of contamination could be identified. Well locations are presented on Figure 2-13. Information collected during the test pit excavation program was used to select well locations. Both wells were placed downgradient of test pits that exhibited signs of potential petroleum contamination (stained soils, odors).

The overburden wells were installed in boreholes advanced using standard drive and wash drilling methods. Minimum 4-inch inside diameter casing was used to advance the borings to refusal. Refusal was encountered in MW-101 at 13 feet bgs and in MW-102 at approximately 29 feet bgs. Till layers were encountered at these depths. The boreholes were backfilled with a bentonite slurry and sand mixture to the desired interval for well construction and screen emplacement.

Each well was constructed of 2-inch inside diameter, non-glued, flush-jointed, threaded Schedule 40 PVC casing and 10-slot (0.010 inch) PVC screen. Screen lengths were selected based on subsurface conditions.

Monitoring well MW-101 was constructed using 5 feet of screen (3 to 8 feet bgs) based on the presence of visual contamination at a maximum depth of 8 to 10 feet bgs, and an initial water level at approximately 5 to 6 feet bgs. Monitoring well MW-102 was constructed using 10 feet of screen (2 to 12 feet bgs), based on the presence of petroleum-like residues to 16 feet, an initial water level at 4.5 feet bgs, and an FID reading up to 2,700 parts per million (ppm) from oily sands 6 to 8 feet bgs. A fine to medium sand was backfilled to approximately 0.5 feet above the well screen and a 0.5 to 1-foot thick bentonite seal was placed above the filter pack. In MW-101, a 0.5-foot thick layer of sand was added to serve as a drainage layer beneath the protective casing. In MW-102, cement was placed in the well annulus from the top of the bentonite seal to the ground surface. Steel, flush-mount protective casings (extending 1 foot below the ground surface) with bolt-down covers were securely set in concrete over the PVC risers. The protective casing tops were set at a height to prevent surface water from flowing into the well casings and to minimize impacts to current site uses. Refer to Appendix O for well construction details.

The State of Rhode Island Groundwater Quality Regulations specify that the well screen slot size shall retain at least 90 percent of the grain size of the filter pack. Soil descriptions at borings MW-101 and MW-102 indicate the presence of silty gravely sand and silty sand, respectively, along the screened intervals. Therefore, a No. 10 (0.01 inch) screen slot size and a No. 1 sand were chosen for monitoring well construction to minimize siltation of the well. A uniform No. 1 sand has an effective grain size (D10 = 10 percent passing or 90 percent retained) of approximately 0.035 inches. The No. 10 screen size retains at least 90 percent of the grain size of a uniform filter pack sand.

2.3.3.2 Well Development

Following well installation, an initial well inspection was conducted and the depth to water was measured to the nearest 0.01 feet using an electronic measuring device. Each well was developed to remove fines and suspended particles from the vicinity of the well screen. Groundwater was evacuated from the wells until water quality parameters for pH, conductvity, and temperature stabilized. Each monitoring well was pumped for approximately 1.5 hours and readings were taken approximately every 5 to 10 minutes. Because visual clarity was not attained after one hour, a turbidity standard of plus or minus 10 percent of successive well volumes was used as a guideline for completing development. This was achieved at MW-102 but not at MW-101. More than 10 well volumes were removed from MW-101 and all field parameters, with the exception of turbidity, were stabilized prior to stopping development. Existing well MW-6R was re-developed. All water removed from the wells during well development activities was containerized in DOT-approved 55-gallon drums.

2.3.3.3 Groundwater Sampling

Groundwater samples were collected and analyzed to assess current groundwater contaminant conditions and the potential presence of light non-aqueous phase liquids (LNAPLs). From July 8 to July 11, 1997, groundwater samples were collected from 13 of 14 existing wells (MW-6S was dry) installed previously by TRC. In addition, samples were collected from two newly installed wells (MW-101 and MW-102) approximately 24 hours following well development.

Prior to sampling, the groundwater level of each monitoring well was measured to the nearest 0.01 foot using an electronic measuring device. Water level readings were collected within a 1.5 hour period surrounding high tide on July 8, 1997, and again on July 11, 1997, during a rising tide. Negligible differences were noted between the water level readings. Additionally, each water column was monitored for the presence of separate phase petroleum products, including both LNAPLs and dense non-aqueous phase liquids (DNAPLs), with an electronic oil/water interface probe. No positive signals (indicative of the presence of NAPLs) were recorded by the instrument in any of the wells during either round of measurements.

Groundwater sampling was performed in 15 wells (13 existing wells and two newly installed wells) using USEPA Region I low stress (low flow) purging and sampling procedures. These samples were analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL metals, and TPH. In addition, at RIDEM's request, groundwater from monitoring wells MW-101, MW-102, MW-9R, and MW-6R was sampled for dissolved TAL metals analysis using standard bailing techniques. The samples for dissolved metals analysis were field-filtered through a disposable 0.45 micron filter following collection, and immediately preserved with concentrated nitric acid prior to shipment. All purge water was containerized in DOT-approved 55-gallon drums at a central storage location.

2.3.4 Shoreline Sediment Investigation

Shoreline sediment sampling was conducted primarily to assess whether asphalt debris along the northern shoreline of Coasters Harbor Island is a contributing source of PAH contamination in the near shore and off-shore sediments. The island's northern shoreline shows signs of erosion; asphalt pavement debris disposed along the shoreline, may have been a potential source of PAH contamination in near-shore sediment samples previously collected.

Another potential source of PAHs evaluated during this investigation was an 8-inch diameter cast-iron pipe. The pipe outlet is located approximately 45 feet north of the northern shoreline. A section of the pipe is only visible at low tide. The pipe outfall extends into and under the water; a sample could not be obtained from the pipe outlet because it was submerged. Refer to Figure 2-13 for the pipe location. Based on available historical drawings, the pipe may have been connected to the oil/water separator associated with former OFFTA activities.

An initial inspection revealed that marine sediments around the pipe exhibited a dark coloration and a sulfur-like odor. Though originally planned as a shoreline sediment sample, sample SS-1 was collected to characterize marine sediments in the vicinity of the pipe and to evaluate potential PAH contamination.

Five sediment samples (plus one field duplicate) were collected along the northern and eastern shorelines (SS-1 through SS-5). Refer to Figure 2-13 for sampling locations. A reconnaissance of the exposed shoreline was performed initially. Of the samples collected from the northern shoreline, two sediment samples (SS-2 and SS-4) represented a mix of weathered asphalt pavement and natural shoreline materials; one sediment sample (SS-3) was comprised solely of asphalt pavement collected from a large mound of asphalt pavement debris; and one marine sediment sample (SS-1) was collected in the immediate vicinity of the exposed pipe at low tide. One sediment sample (SS-5) was collected from the eastern shoreline since this area contained less fill material and debris than other areas. All sediment samples were analyzed for TCL SVOCs, TCL pesticide/PCB compounds, and TPH.

Marine sediment sample SS-1, chiefly composed of fines/silts, was collected from the intertidal zone, which is inundated during every high tide cycle. The shoreline sediment samples, SS-2 through SS-5, may only be wetted seasonally and are composed of coarser materials than those at SS-1.

2.3.5 Storm Sewer Outfall Investigation

The objective of the storm sewer outfall investigation was to determine if PAH constituents were discharging from the storm sewers. An outfall pipe on the northern shoreline was eliminated as a potential sample location because no visible water was flowing from the pipe at low tide. At high tide, the pipe outfall was under water.

In the absence of effluent from the storm sewer pipe outfall on the northern shoreline, two other sample locations were selected. Two storm sewer samples (plus one field duplicate) were collected from a storm drain system that is in-line with the outfall on the northern shoreline (SW-1 and SW-2). Storm sewer sample SW-1 was collected from a manhole on the western side of the central mound. The remaining samples were collected from a catch basin, southwest of Building 144 (upgradient of the site) along Taylor Drive (SW-2). Sample locations are depicted on Figure 2-13.

Upon removal of the on-site manhole cover, the area was vented for approximately 10 minutes. Water levels and conditions within each manhole/catch basin were recorded. An oil/water interface probe was used to measure visible petroleum-like sheens on the water in each structure. The instrument did not record signals, indicating that there was no discernible thickness of separate phase petroleum. Aqueous samples were collected and submitted for full TCL/TAL and TPH analyses. Aqueous samples were collected by direct dip method. Transfer containers were selected based on the type of analysis to be performed. Glass transfer containers were used for analyses requiring glass analysis containers. Polyethylene transfer containers were used for analyses requiring polyethylene analysis containers.

2.4 PHASE III REMEDIAL INVESTIGATION

This section summarizes the Phase III remedial investigation conducted by TtNUS in November 1998. The investigation was conducted to obtain additional data needed to evaluate potential human health risks associated with recreational exposure to surface soil and shoreline sediment at OFFTA/Katy Field. The field investigation included collection of 32 surface soil and 5 shoreline sediment samples. Figure 2-14 provides the locations of the Phase III RI samples.

2.4.1 Surface Soil Investigation

Surface soil was collected from 32 locations (SS-301 – SS-332) across the site. The samples were all collected from the 0 to 1 foot depth interval and analyzed for TCL VOCs, TCL SVOCs, and TCL metals. Additionally, samples from four of the locations (SS-301, SS-308, SS-319, and SS-322) were analyzed for dioxins/furans. These locations were selected and agreed upon during a site visit prior to sampling by representatives of the U.S. Navy, EPA, RIDEM, ATSDR, TtNUS, Gannet Fleming, and NAVSTA Newport. The four locations include one within the toddler play area (SS-319), one beneath the climbing structure (SS-322), one in the baseball field near home plate (SS-301), and one in the shoreline area (SS-308). All samples were collected by hand using stainless steel sampling equipment.

2.4.2 Shoreline Sediment Investigation

Sediment samples were collected from 5 locations (SSD-333 – SSD-337) along the shoreline. The samples were all collected from the 0 to 0.5 foot depth interval and analyzed for TCL VOCs, TCL SVOCs, and TCL metals. All samples were collected by hand using stainless steel sampling equipment. Shoreline sediment samples collected during this phase of the investigation were located approximately midway across the intertidal zone such that they were likely to be inundated with sea water on each daily tidal cycle.

2.5 OFFSHORE ECOLOGICAL RISK INVESTIGATION

This section summarizes the field activities conducted to support the marine ERA. The information presented here was obtained from the ERA Report (SAIC/URI, 2000); refer to Section 7.0 for a summary of the investigation and to the report for a comprehensive discussion of the investigation activities and results. The offshore ecological investigation activities were conducted by SAIC and URI (under subcontract to TtNUS) in 1998 and included sediment sampling and analysis; porewater and elutriate sampling and analysis; toxicity studies; benthic infaunal analysis; and clam, mussel, lobster, and cunner fish sampling and tissue analysis. Figure 2-15 provides the locations of the offshore ERA samples.

2.5.1 ERA Sediment Investigation

This section summarizes the marine sediment sampling and analysis conducted by SAIC/URI for the marine ERA.

2.5.1.1 Sediment Sampling

Sediment samples were collected from 21 stations off the north end of Coasters Harbor Island, adjacent to the OFFTA site, and 2 reference stations approximately 1.2 km south of the site. The sample stations near the site were selected to confirm data from previous investigations, fill data gaps from prior studies, and characterize the offshore gradient in contaminant concentrations. The reference stations were selected to represent baseline, non-impacted biological conditions in a marine habitat comparable to that found around OFFTA. Figure 2-15 provides the locations of the sample stations.

Surface sediment (0 to 15 cm) grab samples were collected at all 23 sample stations. Approximately 2 to 5 grabs were needed at each station to collect sufficient sample volume for the required analyses. The material collected at each station was composited in a 12-liter polyethylene bucket, homogenized with a titanium stirrer and then transferred into pre-cleaned containers for analysis. The samples were stored on blue ice during collection and transport to the lab and at –20 degrees Celsius (° C) at the laboratory (until analysis). The grab samplers were "washed-down" with sea water between grabs at the same station; all sampling apparatus was rinsed with distilled water, 1:1 nitric acid, methanol, and de-ionized water between sample stations.

Deep sediment samples were collected at 6 of the sample stations selected primarily to target the region of high contamination found in the TRC Phase II (1994) study. Deep samples were collected using hand-held coring techniques. Cores were taken to a depth of 1 meter or refusal. The cores were transported in the vertical position to the lab for storage at 4 ° C until logging and sectioning. Sectioning was completed within 48 hours of collection. Sectioned samples were then stored at –20 ° C until chemical analysis.

2.5.1.2 Sediment and Elutriate Analysis

The grab and core sediment samples were analyzed for bulk sediment chemistry and elutriate chemistry, grain size, total organic carbon (TOC), toxicity, and benthic community composition.

Bulk sediment chemistry analysis included samples were analyzed for selected metals, PCB congeners, pesticides, PAHs, and Simultaneously Extractable Metals and Acid Volatile Sulfides (SEM/AVS). Additionally, the grain size distribution of the sediment samples was determined using a particle size analyzer and the TOC of the sediment was estimated by determining the sediment weight lost on ignition at 550 ° C.

Elutriate was prepared as a 1:4 dilution of whole sediment followed by centrifugation. The elutriate was analyzed for metals, PCB congeners, pesticides, and PAHs.

All surface grab sediment samples were also analyzed for porewater/elutriate toxicity using the amphipod 10-day acute test and the sea urchin fertilization test, respectively.

The benthic community structure at each sediment station was evaluated using the sample processing and counting techniques employed in the EPA EMAP program and benthic infauna survey of McAllister Point conducted by Menzie-Cura and Associates in August 1993. The grab sediment samples were sieved at the laboratory to 0.5 mm and organisms were picked from the screen, identified, and counted to species. From the data obtained, community structure parameters including species richness, evenness, and the number of opportunistic forms present were calculated.

2.5.2 Biota Investigation

This section summarizes the biota sampling and analysis conducted by SAIC/URI for the marine ERA.

2.5.2.1 Biota Sampling

Biota samples were collected at the 23 sample stations where sediments were collected. The species collected included blue mussel, hard clams (*Mercenaria mercenaria and Pitar morrhauna*), lobster, and cunner fish. The target species at each station were determined based on the habitat in that area. The target species at the intertidal stations (OFF-1 through OFF-7 and OFF-22) were the blue mussel and cunner, representing epifaunal and pelagic exposure pathways. The target species at the subtidal stations (OFF-8 through OFF-21 and OFF-23) were hard clams and lobster for the infaunal and epibenthic exposure pathways and deployed mussels as indicators of the pelagic water column conditions.

Lobsters were collected by baited trap and typically required an extended sampling period to collect a sufficient biomass for chemical analysis. Deployed mussels were contained in cages, suspended off the sea floor and held in place by anchor weights and moorings. The cages were deployed for 8 weeks.

2.5.2.2 Bi ta Analyses

Biota tissue analyses included the same analyses as conducted for the sediment: metals, PCB congeners, pesticides, and PAHs. In addition, the lipid content of tissue was determined for use in bioaccumulation factor calculations.

Bivalve and fish tissue were frozen whole after collection and were analyzed whole. Bivalves were resected at the analytical laboratory prior to analysis. Lobsters were resected immediately following euthenization to obtain tissue and claw muscle. Shell and exoskeletal material were not analyzed for any species.
Condition indices were determined for indigenous and deployed mussels by determining the ratio of dry tissue weight to shell length, weight, and volume. Fish and lobsters were inspected for external evidence of damage (fin rot, gill lesions, shell disease, etc.). Indigenous mussels were also assayed for the presence of hematopoeitic neoplasia, a blood cell disorder correlated with contaminant exposure.

The deployed mussels were also analyzed for fecal pollution indicators. Total and fecal coliforms, fecal streptococci, enterococci, and *Clostridium perfringens* spores were enumerated in the deployed mussel tissue using the most probable number (MPN) analytical method.

2.6 BACKGROUND SOIL INVESTIGATION

This section summarizes the sampling, analysis, and evaluation conducted for the background soils investigation. Refer to the Background Soil Investigation Report (TtNUS, 2000) for a more comprehensive discussion of the investigation activities and findings. TtNUS conducted the background soil sampling in February 2000. Figure 2-16 shows the locations of the background soil samples.

2.6.1 Sample Collection and Analysis

The objective of the background sample collection was to obtain surficial and shallow subsurface soil samples to use in establishing background concentrations of metals in the vicinity of the OFFTA Site. To be acceptable for this use, the sampled soils had to be representative of soils that may have been found at the OFFTA site prior to fire-fighting training activities. To accomplish the study objectives, the background soil samples were collected from undisturbed locations on Coasters Harbor Island determined to be free of influence from either the site or other non-uniformly distributed anthropogenic sources. The soil samples were collected from the one soil type that is prevalent at OFFTA and across Coasters Harbor Island: the Udorthents-Urban Land Complex.

Consistent with the approved work plan, two soil samples were collected (if possible) from ach of the 20 selected background sample locations: a surface sample (from 0 to 2 feet bgs) and a subsurface soil sample (from 4 to 6 feet bgs). At three locations the subsurface sample was not collected because refusal was encountered at less than 4 feet bgs. Soil samples were collected using a Geoprobe ™ direct push drill rig that advanced a decontaminated stainless steel sampler with a new acetate liner for each sample to the target depths at each location. Each sample was homogenized using a clean disposable trowel and plastic bag then transferred to the appropriate sample containers. The samples were all analyzed for TAL metals. Laboratory data validation (Tier III) was performed by chemists to ensure data quality and data validation memoranda were prepared. The analytical data are presented in the Background Soil Investigation Report (TtNUS, 2000) and are provided in Appendix P of this report.

2.6.2 Statistical Evaluation

Following the completion of the background soil sample analyses and analytical data review, data analysis and statistical testing were performed. The background data for metals underwent an exploratory evaluation that consisted of several statistical comparisons that determined whether data from different sampled areas and depth categories are appropriately treated separately or combined into final background data set(s). All statistical tests were performed in accordance with the guidance and recommendations presented in several EPA and related publications (EPA, 1989a, 1989b, 1992b, 1992c, and 1996d; US Navy, 1999; Gilbert, 1987 and 1993) cited at the end of this report.

Several quantitative statistical comparisons were performed to determine whether surface and subsurface soil data could be combined to establish a single background concentration for soil (rather than separate concentrations for surface and subsurface soil) and whether all data collected could be used for background determination. This evaluation concluded that the metals concentrations in surface and subsurface soils were statistically different; therefore, the data could not be combined and background concentrations had to be determined for each strata. Additionally, the evaluation concluded that data from three sample locations in an area distinct from the rest of the background sampling area could not be used in determining the background concentrations because these data were statistically different from the rest of the data.

Using data from the remaining 17 sample locations, background values were calculated for each metal detected in the surface and subsurface soil. For most metals, 95 percent upper tolerance limits (UTLs) were calculated for use as background values. However, UTLs were not calculated for several metals because of poor fit to normal or lognormal distributions (a UTL can not be calculated for a data set that is not normally or lognormally distributed). For these metals, the maximum detected value was recommended as the background value. See the Background Soil Investigation Report (TtNUS, 2000) for a comprehensive discussion of the statistical evaluation. The calculated background concentrations are presented in Section 4.0 of this RI.

3.0 PHYSICAL CHARACTERISTICS

This section of the report presents information on the regional physiography, regional and site-specific geology, regional and site-specific hydrology, and regional and site specific hydrogeology.

3.1 REGIONAL PHYSIOGRAPHY

This section is divided into five subsections: climate, setting and topography, threatened and endangered species, terrestrial habitats, and marine habitats. Regional geology and hydrogeology are addressed in separate sections following this discussion.

3.1.1 Climate

NAVSTA Newport is situated in a temperate climate zone characterized by wide variations in seasonal temperatures. Atmospheric conditions are influenced by the naval station's proximity to Narragansett Bay and the Atlantic Ocean, which affect the area's temperatures. Winter temperatures are somewhat higher and summer temperatures lower, than more inland areas. The orientation of Narragansett Bay exposes the bay water and coastline to southerly sea breezes in summer months and nor'easter storms in the winter (SAIC 2000).

Temperature, precipitation and snowfall data collected at the Newport, Rhode Island meteorological station between 1957 and 2000 follow. All of this data was provided by the Northeast Regional Climate Center at Cornell University (NRCC 2000).

According to records, the average annual temperature has varied between a maximum of 58.5 and a minimum of 43.2 degrees Fahrenheit (°F). January and February were the coldest months with a mean minimum temperature approximately 23.6°F. July and August were the warmest months with a mean maximum temperature approximately 78.2°F.

The average annual precipitation for the station was 45.31 inches. For the period between 1957 and 2000, the average monthly precipitation ranged from 2.87 inches for July to 4.50 inches for March. The wettest months on average were March, April, November, and December. The average seasonal snowfall was approximately 21.6 inches whereas, in nearby Providence, Rhode Island, an inland area, the average seasonal snowfall was 35.5 inches. In Newport, January and February each averaged approximately 7.1 inches of snow. In Providence, the average monthly snowfall amounts for January and February were 9.8 and 10.2 inches, respectively.

According to records from July 1996 through June 2000, the average wind speed measured at the Newport State Airport was 9.1 miles per hour (mph). The airport is located in Middletown, Rhode Island. The prevailing wind direction between November and December has been west-northwest. In January and February, the prevailing wind direction has been from the north (NRCC 2000). These winds are due to high-pressure weather systems off of the Canadian Shield (SAIC 2000). The prevailing wind direction between May and August has been from the south-southwest (NRCC 2000). Bermuda high-pressure systems drive the winds from the southwest during spring and summer months (SAIC 2000).

3.1.2 Setting and Topography

NAVSTA Newport is located in the Narragansett Bay Basin (USDA 1981). NAVSTA Newport occupies approximately 1,063 acres, with portions of the facility located in the City of Newport and Towns of Middletown and Portsmouth, Rhode Island. The facility follows the western shoreline of Aquidneck Island for nearly 6 miles facing the East Passage of Narragansett Bay (Figure 1-1). OFFTA is located in the southern portion of NAVSTA Newport, at the northern end of Coasters Island. The property occupies approximately 5.5 acr s and is bordered by Taylor Drive to the south and Narragansett Bay and Coasters Harbor to the north, east, and west.

The islands in Narragansett Bay are elongated and generally oriented in a north-south direction as a result of glacial movement. Elevations at NAVSTA Newport range from near mean sea level (MSL) to approximately 170 feet above MSL in the Melville North area (USGS 1975). Areas at low elevations are susceptible to flooding during storm surges. Portions of OFFTA are located in special flood hazard areas inundated by a 100-year flood. Zone AE, which covers all of OFFTA with the exception of the central mound, has a base flood elevation of 13 feet (FEMA 1990). Therefore, all areas below this elevation will be inundated by water during the 100-year flood. The central mound is located in Zone X which designates areas of 500-year flood. Base flood elevations were not determined for the Zone X area at OFFTA (FEMA 1990).

Ground-surface elevations on the OFFTA property range from 7 to 30.7 feet above Naval Base mean low water (MLW). OFFTA topography is characterized by two mounds of buried construction debris on the west and central portions of the property separated by flat terrain. These mounds were created when the training structures were demolished. The west mound rises approximately 17.7 feet above MLW. Elevation of soil boring B-14 on top of the central mound is approximately 30.7 feet above MLW (TRC 1994). The site topography slopes slightly from the south to the north-northwest, with the northern edge of the property slightly higher in elevation than the shoreline of the Bay. Before it was a fire training area, this property was occupied by few permanent structures, and had been graded in certain areas. Historical photographs have shown that blasting was performed to level part of the site. The majority of the facility was located on this level portion of the property. Ground elevations ranged from approximately 7 feet above Naval Base MLW on the north-

northwest side of the property to 12 feet above Naval Base MLW on the southeast side of the property (Federici 1999).

3.1.3 Threatened and Endangered Species

According to the Old Fire Fighting Training Area Ecological Risk Assessment Report (TRC 1994), there is low potential for habitation of federal or state endangered or threatened species at OFFTA. All of the OFFTA property has been disturbed or developed. The great blue heron (Ardea herodias) and the herring gull (Larus argentatus) are avian species that have been identified as target receptors of concern; however, neither of these birds is identified on the federal or state endangered or threatened species list for Rhode Island (RIDEM 1999).

3.1.4 Terrestrial Habitats

Coasters Harbor Island has been the site of Navy activity since the 1880s. Most of the island's soil areas have been disturbed or impacted by imported fill (Navy in Newport). Island areas potentially outside the influence of anthropogenic sources are discussed in the Background Soil Investigation for Old Fire Fighting Training Area, Naval Station Newport, Newport, Rhode Island (TtNUS 2000). According to the United States Department of Agriculture (USDA) Soil Survey of Rhode Island (issued 1981), soils on Coasters Harbor Island are classified Udorthents-Urban Land Complex (UD) or Urban Land (Ur). Areas designated "UD", such as at the OFFTA property, consist of soils that have been disturbed by cutting and filling, and areas covered by building and pavement. Areas designated "Ur" primarily consist of sites for buildings, paved roads, and parking lots.

In 1976, OFFTA was converted from a training facility to a maintained recreational area called Katy Field. A playground, picnic area with an open pavilion and barbecue grills, and a baseball field were constructed on the property. The terrestrial habitat of the OFFTA property is a maintained (i.e. mowed) grass lawn. The lawn extends north to the shoreline but is not found around the baseball infield, some of the playground areas, and areas otherwise occupied by buildings or pavement. Few trees, Austrian black pines and red cedars, are growing on the property (SAIC 2000). In November 1998, the property was enclosed with a chain-link fence and the recreational facility closed.

The gravel and cobble shoreline to the north has been used as a repository for construction debris, including concrete slabs, reinforcing , brick, and asphalt.

In 1994, surveys conducted by Menzie-Cura & Associates, Inc., identified habitats and wildlife in the vicinity of OFFTA. The methods and detailed results of those surveys are reported in the Menzie-Cura & Associates report (1994) (SAIC 2000).

3.1.5 Marine Habitats

The marine habitat discussion presented in this section is based on data collected during the marine ecological risk assessment for the Old Fire Fighting Training Area. Refer to the Old Fire Fighting Training Area Ecological Risk Assessment Report (2000) by Science Applications International Corporation (SAIC) for complete details.

Coasters Harbor is a shallow cove connected to the East Passage of Narragansett Bay. The harbor is open at each end. A wide mouth faces west and a narrow opening at the head faces south. Water can enter and leave the harbor at each end (Kincaid et al 1996). The depth of the harbor at the mouth is approximately 20 feet at mean low water. At the head, the depth of the harbor is approximately 3 feet at mean low water. A tidal difference of approximately 3.5 feet has been recorded for Coasters Harbor. Circulation patterns and energies within the harbor are dominated by the tides and wind driven flow (Kincaid et al. 1996). Hydrographic studies performed in 1996 indicate that water enters and exits at both the west and south openings, and does not show a consistent directional flow pattern (Kincaid et al 1996).

The estuarine system in the vicinity of OFFTA primarily includes subtidal environments, sand- or silt-substrate, with some eelgrass covering the intertidal environments. The dominant taxa in the silty, subtidal, infaunal communities (less than 60 percent sand content) of Coasters Harbor included the bivalve *Nucula proxima, oligochaetes* species (aquatic worms), and the arthropod *Microdeutopsis.* The sandy, intertidal, infaunal communities (greater than 70 percent sand content) were found north of Coasters Harbor. Organisms and species that numerically dominated the benthic community at sandy intertidal stations included the snail *Littorina littorea,* the blue mussel *Mytilus edulis,* and to a lesser extent, *oligochaetes* (SAIC 2000).

The infaunal benthic, epibenthic, and pelagic communities in Coasters Harbor represent important marine habitats. Infaunal benthic communities exist within sediment depositional areas. Epibenthic communities exist on sediment depositional areas. Pelagic communities exist within the open ocean. Species within some of these communities are highlighted below.

The blue mussel is an epibenthic species. "This species is a locally abundant and ecologically important filter-feeding bivalve found in subtidal and intertidal habitats. It is an important food source for fish, birds, starfish, and occasionally humans (SAIC, 2000)." In the Ecological Risk Assessment (ERA) this species was identified as a target receptor in the intertidal environment. Blue mussels in Coasters Harbor were considered surrogates for epibenthic species that are potentially exposed to water-borne and particulate-bound contaminants, which presumably originate from OFFTA.

The lobster (Homarus americanus) is also an epibenthic species. "This species is locally abundant, and an ecologically and economically important subtidal crustacean which feeds opportunistically as a scavenger. It is an important food source for fish and humans (SAIC, 2000)." In the ERA this species was identified as a target receptor in the subtidal environment. Lobsters in Coasters Harbor are potentially exposed to bulk sediment and water-borne contaminants, which presumably originate from OFFTA.

Hard clams (*Mercenaria mercenaria/Pitar morrhuana*) represent infaunal benthic species. These bivalve filter feeders are locally abundant, ecologically and economically important, and they provide a food source for birds and occasionally humans. In the ERA these species were identified as target receptors in the subtidal environment. *Mercenaria mercenaria* is an indicator species for infaunal bivalves. Hard clams in Coasters Harbor are potentially exposed to bulk sediment and pore water contaminants, which presumably originate from OFFTA In Narragansett Bay, *Mercenaria mercenaria* is an important commercial species for Rhode Island.

Cunner (*Tautogolabrus adspersus*) are pelagic finfish species. "These species are locally abundant and ecologically important estuarine fish, which feed opportunistically upon both plants and animals..." (SAIC, 2000). They may serve as an important food source for birds and other fish. In the ERA these species were identified as target receptors in the pelagic community. Cunner were considered a surrogate for other pelagic fish species potentially exposed to contaminants in bulk sediment and the water column, which presumably originate from OFFTA.

Winter flounder (Pleuronectes americanus (=Pseudopleuronectes a.)) is a benthic finfish species. "This species is a locally abundant, ecologically and economically important fish. It is an important food source for birds, predatory fish, and humans (SAIC)." In the ERA this species was identified as a target receptor in the benthic community. Flounder and other similar benthic species are potentially exposed to water-borne and bulk sediment contaminants, which presumably originate from OFFTA.

The benthic community is ecologically important and serves as a major food source for birds and fish, as well as for benthic and epibenthic invertebrates. As a whole, this community is potentially exposed to bulk sediment and water-borne contaminants, which presumably originate from OFFTA.

It should be noted that the Rhode Island Department of Environmental Management (RIDEM) has designated the area of Narragansett Bay along the NAVSTA Newport shoreline, including Coasters Harbor, as a shellfish closure area due to known or potential sewage discharges in the area. However, the effectiveness of the ban for preventing shellfishing is uncertain and the ban applies only to a few species of shellfish (bivalves only); it does not apply to lobster or finfish. A map showing the shellfish closure areas is presented as Figure 3-1.

3.2 GEOLOGY

This section presents a brief overview of the regional geology, as well as site-specific geology. Much of the regional geologic information was presented in the IAS report prepared by Envirodyne Engineers, Inc. (1983) and is summarized in this section. The site-specific geologic information is based on data collected during investigations identified in Section 2.0.

3.2.1 Regional Geology

Regional geologic information pertinent to the Remedial Investigation for OFFTA at NAVSTA Newport is presented below. This discussion is divided into two subsections: overburden and bedrock.

3.2.1.1 Regional Overburden Geology

The geology of the region, in general, consists of glacially derived unconsolidated deposits overlying Pennsylvanian age sedimentary bedrock (USDA 1981; Hermes et al 1994). Wisconsin-age glaciers covered the region with ice several thousand feet thick. During ice advances, sediment and bedrock were erod d and carried beneath the ice sheet. As the glaciers melted and receded, unconsolidated glacial materials of variable thickness were deposited throughout the Narragansett Basin area. These glacial materials included till and sorted sand, silt, and gravel (USDA 1981; EEI 1983).

Till is the most extensive of the glacial deposits in Rhode Island. This glacial deposit is unstratified and widely heterogeneous in grain size distribution, typically comprised of fine (clay/silt/sand) and coarse (pebbles/cobbles/boulders) fractions (USDA 1981). In southern New England, the late Wisconsinan surface till is predominant. Published reports indicate that the surface till forms a discontinuous mantle over bedrock uplands and beneath stratified drift deposits In general, the surface till comprises a loose sandy unit containing boulders and cobbles, and lenses of stratified sediments. However, surface tills vary in composition. The physical characteristics of surface till generally reflect local bedrock and older surficial materials from which the deposit was derived (Melvin et al 1992).

Regionally, the Upland till plains, the Narragansett till plains, and the Charlestown and Block Island end moraines are till deposits in Rhode Island. NAVSTA Newport, in particular OFFTA, is located on the Narragansett till plain. This glacial till deposit may have been derived from a sedimentary and meta-sedimentary rock provenance (USDA 1981).

Stratified drift or outwash, composed of sorted sand, silt, and gravel deposits were laid down by glacial meltwaters as the ice sheet receded. The eroded materials carried by the glacial meltwater were deposited in irregular layers of various thicknesses. Regionally, large deposits of outwash are located in Providence and East Greenwich (USDA 1981).

3.2.1.2 Regional Bedrock Geology

Narragansett Basin is an ancient structural basin originating near Hanover, Massachusetts. This basin is a complex synclinal mass of Pennsylvanian aged, non-marine sedimentary rocks, and is the most prominent geologic feature in eastern Rhode Island and adjacent Massachusetts. The basin's approximate length is 55 miles; its width varies from 15 to 25 miles. The western margin of the basin is in the western portion of Providence, Rhode Island, and the eastern margin extends through Fall River, Massachusetts. Exposures of older rocks on Conanicut Island and in the vicinity of Newport suggest that the southern extent of the basin may be near the mouth of Narragansett Bay. OFFTA is situated at the southeastern end of the Narragansett Basin (EEI 1983).

The rocks within Narragansett Basin chiefly consist of conglomerates, sandstones, shales, and anthracite. Total thickness of the strata in the basin has been estimated at 12,000 feet. Many folds and some faults occur throughout the basin, but the character and amount of the folding and faulting was not evaluated as part of this report. Refer to Hermes et al (1994) for a depiction of the faults mapped in the surrounding area.

The bedrock of the Narragansett Basin has been divided into six units including the Purgatory Conglomerate and the Rhode Island Formation, which underlie OFFTA (Hermes et al 1994). The contact between the two units has been mapped crossing the eastern portion of the site in a north-south direction. Refer to Hermes et al (1994) for a detailed depiction of the bedrock geology of Rhode Island.

The Purgatory Conglomerate is a buff to pale-gray conglomerate. This formation consists of pebbles, cobbles, and boulders comprised of quartzite. The matrix is primarily quartz. Some of the cobbles and boulders have been elongated as a result of tectonic forces in the southern portion of the basin (Hermes et al 1994).

The Rhode Island Formation is the most extensive and thickest of the Pennsylvanian formations in Rhode Island. The majority of the Narragansett Basin is underlain by this formation. In northern Rhode Island, the Rhode Island Formation is not metamorphosed and primarily consists of gray to black, fine- to coarse-grained quartz arenite, litharenite, shale, and conglomerate. However, in the southern portion of the basin, such as in the vicinity of NAVSTA Newport, this unit has been metamorphosed. Metasedimentary rocks, including metaconglomerates and metasandstones, as well as schist, carbonaceous schist, phyllites, and graphite are present within the formation (Hermes et al 1994).

3.2.2 Site Ge logy

This section summarizes the overburden and bedrock geology beneath OFFTA. It describes the general nature of the unconsolidated geological units, a description of the bedrock, and identification of potential preferential contaminant pathways in various geological units. The geologic summary is based on data from published maps as well as previous subsurface investigations including the Phase I and Phase II RI conducted by TRC and work performed by TTNUS during the Source Removal Evaluation (SRE). Refer to Appendices C, E, F, and O. Each field investigation is detailed in Section 2.0.

Subsurface investigation activities conducted under the Phase I RI included the drilling and sampling of six test borings and five well borings. Subsurface investigation activities conducted during the Phase II RI included the drilling and sampling of 11 test borings and 9 well borings, and the excavation of 3 test pits. Subsurface work performed during the SRE included the advancement of 2 soil borings, installation of 2 monitoring wells, and excavation of 17 test pits. Information regarding overburden stratigraphy and bedrock was obtained from drilling operations and test pit excavations. The locations of the SRE soil borings, monitoring wells, and test pits are shown on Figure 2-13. Using the information from available logs, five geologic cross-sections were prepared for the site. Figures 3-2 and 3-3 present the cross-sections through the site. Cross-section orientations are presented on each map. Boring logs, test pit logs, and monitoring well construction logs generated during the SRE are presented in Appendix O.

The overburden materials beneath the site were divided into six unconsolidated units: fill; fine to medium sand, silt, and gravel; coarse sand and gravel; peat; silt; and glacial till. Each of these units is described below.

FILL

Historical records indicate that the site's topography was altered for the establishment of the fire fighting training area. Upon closure in 1972, the majority of the structures and features associated with fire fighting activities were demolished, buried in two soil mounds, and covered with topsoil. These mounds reportedly contain rubble from the demolition of the former fire fighting structures. The top layer of soil across the site (at least 6 inches) is fill that was placed after the fire training area was closed. In 1976, the site was dedicated as a recreational area with a playground, picnic area, and baseball field. The surface of the baseball field is imported soil; imported sand is beneath all playground equipment. All other areas are vegetated with grass.

As shown on the geologic cross-sections, fill was identified throughout much of the site. Fill was encountered in borings advanced through the central (B-14 and B-15) and western (B-8 and B-9) mounded areas of the site, and test pit excavations (TP-02 through TP-07) east of Building 144. Several borings advanced along the northern shoreline (MW-10, MW-2D, MW-102, B-13, and MW-11R) also encountered fill materials. Refer to

Figures 3-2 and 3-3 for complete details. In these areas, fill consists of a mixture of natural and man-made materials. The natural materials include various amounts of fine to medium sand, silt, gravel, and rock fragments. Man-made materials consist of construction debris, including asphalt, brick, ceramic pieces, concrete, glass, metal, and wood. Fill without debris was evident in the playground area, baseball field, area between the soil mounds, and in the eastern portion of the site where loam (silt, sand, and organic matter) was identified.

Fill thickness varies across the site, ranging from approximately 0.5 feet at B-12 to more than 20 feet in the central mound. Borings logs for B-14 and B-15 in the central mound indicate fill extends below grade and may have been deposited directly on the bedrock surface. Borings MW-11R and MW-102 also indicate thick layers of fill. The increased thickness of fill in this area was likely the result of burying construction debris after the demolition of the fire training area. Lesser amounts of fill were observed in the fenced playground area at B-17 and test pits TP-08 and TP-09.

SILTY SAND AND GRAVEL

The predominant overburden material beneath the site is comprised of fine to medium sand, silt, and gravel with varying amounts of rock fragments and seashell fragments. This unit was present in a majority of the borings across the site. At B-14, B-15, and MW-11R, the sand, silt, and gravel unit is absent; fill material appears to have been deposited directly onto the bedrock surface. The unit is also absent at B-8, MW-101, and MW-102. Boring logs at these locations indicate fill material overlies till. At B-9, the native fine to medium sand, silt, and gravel unit was not encountered. This boring met refusal and could not be advanced beyond the fill material in the western mound.

The thickness of the silty sand, and gravel unit varies across the site. In the eastern portion of the site (MW-1R and B-18), where bedrock is shallow, the thickness of the unit ranges from approximately 1 to 5 feet. Bedrock depths increase in the western portion of the site (between the soil mounds) and along the northern shoreline of Coasters Harbor. The thickness of the unit at borings MW-3S and MW-4S is approximately 15 feet. At MW-2D, along the shoreline, the unit is more than 20 feet thick.

Soil boring logs indicate fill mixed with debris is in direct contact with the silty sand and gravel unit at boring locations B-2, B-6, B-9, B-11, and B-13; well locations MW-2D/2S, MW-3S, and MW-4S. The debris in all of these borings, with the exception of B-9, was limited to the top 2 to 4 feet. Borehole descriptions indicate that trace to little quantities of asphalt, brick, concrete, and wood were encountered. At B-9, located in the western mound, debris was detected the length of the borehole.

SAND AND GRAVEL

This unit primarily consists of fine to coarse sand and gravel. It was reported separately from the silty sand and gravel unit because of its lower silt content. The sand and gravel deposit was encountered in borings B-12 (north-central portion of the site between the soil mounds), B-16, and test pit TP-14 (northern shoreline along Coasters Harbor). Cross-section B-B' (Figure 3-2) indicates that the east-west extent of this deposit is limited to the area between MW-10S and MW-2S. This section indicates the sand and gravel deposit is approximately 12 feet thick at this location and is underlain by peat and silt. Cross-section D-D' (Figure 3-3) shows fill at MW-11R (north-northeast of B-12) and the sand, silt, and gravel unit at MW-4S (southwest of B-12). This section indicates the sand and gravel unit at B-12 is approximately 14 feet thick and was deposited directly on the bedrock surface.

The sand and gravel unit is expected to have a higher hydraulic conductivity compared to other units identified at the site. This unit may act as a preferential pathway for groundwater and contaminants.

PEAT

A layer of peat was encountered in several of the borings completed at the northern edge of the site along Coasters Harbor, (refer to cross-sections B-B' and E-E' (Figures 3-2 and 3-3)). Borings B-13 and B-16, and monitoring well MW-2D encountered peat layers ranging in depth from approximately 12 to 14 feet below grade. The thickness of the peat layer ranged from 0.5 feet (MW-2D) to 5 feet (B-13). Fine sand and silt stringers were noted within the peat. The peat is in contact with silt. It does not appear to extend west of B-13.

The peat and associated fine-grained materials are not expected to represent a significant contaminant pathway.

SILT

Silt was encountered in several of the borings completed at the northern edge of the site along Coasters Harbor, (refer to cross-sections B-B' and E-E' (Figures 3-2 and 3-3)). Borings B-13 and B-16 encountered fine-grained beds of silt below peat at approximately 16-17 feet below grade. The thickness of the silt layers ranged from 1.0 foot (B-13) to 2.5 feet (B-16). At B-13, the silt is in contact with bedrock. This unit is located between MW-102 along the northern shoreline and MW-3S in the central portion of the site. Fine sand and little gravel were observed within the silt at B-16.

In the south-central portion of the site silt was encountered at B-6, as shown on cross-section E-E' (Figure 3-3). This deposit was encountered approximately 10 feet below grade. The B-6 boring was ended 14 feet below grade. Based on the boring log, the thickness of the unit could not be determined. However, seismic refraction survey results suggest the bedrock surface is approximately 20 feet below grade near this location. Therefore, this unit may be 10 feet thick, or less. The geometry of the unit has not been determined. The silt layer contains clay and trace amounts of gravel. Silt was not encountered at MW-3S or MW-101, located northeast and southwest of the boring, respectively.

South of Taylor Drive, silt was encountered in MW-5S, as shown on cross-section C-C' (Figure 3-3). This deposit was encountered beneath fill, approximately 4 feet below grade. According to the boring log, this deposit consisted of silt, some fine sand, and little clay. This unit was described separately from the more prevalent sand, silt, and gravel unit across the site. The MW-5S boring log suggests a higher percentage of fines were encountered at this location. The geometry of this unit has not been determined. The silt deposit is approximately 14 feet thick. Boring MW-5S was not advanced more than 17.5 feet below grade. At this depth, weathered shale was visible; split-barrel refusal occurred.

Fine-grained sediments generally have lower hydraulic conductivity values than surrounding sands and may act as potential barriers to contaminant transport.

TILL

A till unit consisting of silt; some subrounded to angular, fine gravel; fine to coarse sand; and rock fragments was encountered at soil and well borings B-8, B-11, MW-101, MW-102, and MW-2D. Boring B-8 was advanced through the western mound, as shown on cross-section A-A' (Figure 3-2). Boring B-11 (Figure 3-3) was completed in the southwest corner of the site, adjacent to the western mound. Monitoring well MW-101 was advanced in the south central portion of the site, as depicted on cross-section E-E' (Figure 3-3). Wells MW-102 and MW-2D are along the northern shoreline, adjacent to Coasters Harbor, as shown on cross-section B-B' (Figure 3-2). This silty gravelly sand unit is denser than the more prevalent silty sand and gravel unit across the site. It was interpreted as glacial till. As defined, glacial till consists of an unstratified mixture of clay, silt, sand, gravel, and boulders. A single Shelby Tube sample of the till from B-11 indicated a triaxial permeability of 2.7 x 10^{-7} cm/sec (7.7 x 10^{-4} feet/day).

Thickness of the silty gravelly sand unit (till) varies across the site. Along the northern shoreline, the thickness of the unit ranged from 3 to 17 feet. On the western portion of the site, the till was at least 12 feet thick. At MW-101, till is at least 8 feet thick. Beneath the site, till forms a discontinuous mantle over bedrock. The geometry of this unit has not been defined. Additional data is needed to accurately map this unit.

The boring log from MW-101 indicates oil (sheen) was observed on samples S-3, S-4 and S-5. Soil from th s intervals was interpreted as till. This suggests that this unit may not serve as an effective barrier for the vertical migration of petroleum.

BEDROCK

Bedrock beneath OFFTA was described during drilling programs conducted as part of Phase I and II of the RI. "Based upon cobbles which were observed in several of the borings prior to encountering the bedrock, and the exposed bedrock on the shoreline, the bedrock in this area is interpreted to be a conglomerate, with large cobbles interbedded with sandstone and graywacke" (TRC 1994). Though not identified as bedrock, gray weathered shale was recorded on the boring log for MW-5S. Presumably, the "shale" represents the Rhode Island Formation, as previously described.

The depth to bedrock varies across the site. During Phase I, bedrock was encountered in one boring, MW-1, at a depth of 6 feet below grade and consisted of brown-gray sandstone. Bedrock was encountered in nearly all of the Phase II borings, at depths ranging from 2 feet (B-18) to 29 feet (MW-2D) below grade. Top-of-bedrock elevation contours are shown on Figure 3-4. Bedrock elevations are based on the depth to bedrock observed in test pits and borings. Seismic refraction survey results were used to supplement these data. If a refusal was noted in a boring the top of bedrock was assumed to be within one foot of the refusal depth. The bedrock contours are interpretations of these data and the actual bedrock elevation may be different from th elevation indicated. Generally, the bedrock surface was encountered at shallow depths on the east-southeast portion of the site, and greater depths north of the central mound, adjacent to Coasters Harbor. Borings completed as monitoring wells MW-8 and MW-9 encountered bedrock before the water table, at 6 feet and 4 feet below grade, respectively. Borings B-14 and B-15, advanced through the central mound, possibly encountered bedrock 23 feet and 20 feet below grade, respectively. Relative to the base of the mound, thes depths are consistent with bedrock depths of approximately 4 to 5 feet below grade.

As shown on cross-sections A-A' and C-C' (Figures 3-2 and 3-3) as well as the contour map (Figure 3-4), the bedrock surface dips noticeably along the north and west sides of the central mound. This was noted during the seismic refraction survey, and confirmed by borings completed in these areas. Boring B-6 and monitoring wells MW-3 and MW-7 were all completed to a depth of 14 feet without encountering bedrock. According to the seismic refraction data, a bedrock basin oriented northwest southeast is present in this area. Seismic estimates for the depth to bedrock at B-6, MW-7 and MW-3 ranged from 20 to 23 feet below grade. These depths to bedrock were converted to elevations and used with other data to construct the contour map, Figure 3-4.

Along the north side of the central mound, bedrock rises east towards MW-10S (12.5 feet) and west towards MW-11 (14 feet) from MW102 (29 feet) and MW-2D (29 feet). Refer to cross-section B-B' (Figure 3-2). Beneath the western mound overlooking Narragansett Bay, the bedrock surface was not encountered at borings B-9 or B-10; however, these borings could not be advanced beyond the fill at 7 and 13 feet below grade, respectively. Bedrock was not encountered at B-8. This boring was advanced 23 feet below grade. Bedrock was encountered at boring B-11, which was completed between the two western mounded areas, at a depth of 21 feet below grade.

Weathered rock characterizes the bedrock surface at locations MW-2D, B-11, B-13, and B-14. At B-13, the upper 12-feet of rock is weathered; no other on-site borings in this area encountered as thick a weathered zone. Offsite, at MW-6R, the upper 21 feet of rock is weathered. The bedrock surface appears to be competent beneath locations MW-8R, MW-9R, MW-11R, and B-17. Refusal occurs shortly after contact with the bedrock surface. An air rotary drilling technique was used to complete bedrock borings at MW-8R, MW-9R, and MW-11R. The top of bedrock has not been confirmed at the site by coring.

3.3 HYDROLOGY AND HYDROGEOLOGY

The purpose of the geologic investigation was to provide a structural context to understand groundwater flow and potential contaminant migration beneath the site. In light of the regional and site geology described above, Section 3.3 describes the regional and site hydrogeology.

3.3.1 Regional Surface Water Hydrology

NAVSTA Newport is located within the Narragansett Bay drainage basin. The basin covers an area of approximately 1,850 square miles, of which 850 square miles are in Rhode Island (USDA 1981). All surface water drainage from the Narragansett Bay drainage basin empties into Narragansett Bay. At NAVSTA Newport, precipitation evaporates, infiltrates the soil or flows overland toward catch basins or several small streams and ponds. The primary stream flow direction is to the northwest, toward Narragansett Bay or Coasters Harbor (USGS 1975). Surface runoff controlled by storm water collection systems (i.e. culverts and catch basins) discharges directly into Narragansett Bay or Coasters Harbor.

3.3.2 Regional and Area Surface Water Classifications

All surface waters of Rhode Island have been categorized according to water use classifications considering public health, recreation, propagation and protection of fish and wildlife, as well as economic and social benefit. According to RIDEM's Water Quality Regulations and Water Quality Classification Descriptions, each class is defined by the most sensitive water uses to be protected (RIDEM 1997). Generally, all waters shall be suitable for aquacultural uses, navigation, and industrial cooling, and have good aesthetic value.

Two freshwater streams located on NAVSTA Newport property, near the town boundary between Middletown and Portsmouth, have been identified as Class "B" surface waters. Class "B" surface waters are designated for fish and wildlife habitat, as well as primary and secondary contact recreational activities. These waters shall be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses (RIDEM 1997).

Most of Narragansett Bay is described as Class "SA". This water quality classification, like "SB" or "SB1", denotes the water quality goal for the waterbody. Class "SA" seawaters are designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat. Areas classified as "SB" are designated for primary and secondary contact recreational activities, shellfish harvesting for controlled relay and depuration, and fish and wildlife habitat. Class "SB1" waters are designated for primary and secondary contact recreational activities, and fish and wildlife habitat. Primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges. SC-classified areas are designated for secondary contact recreational activities, and fish and wildlife habitat (RIDEM 1997).

Surface waters adjacent to the Old Fire Fighting Training Area site on Coasters Harbor Island, are classified as "SB{a}" waters. The "SB" classification is defined above. The {a} designation following the "SB" indicates a partial use designation is in effect due to impacts from combined sewer overflows. Primary contact recreational activities, shellfish uses, and designations for fish and wildlife habitat will likely be restricted (RIDEM 1997).

3.3.3 Site Surface Water Hydrology

No surface water bodies are present on the Old Fire Fighting Training Area site. The general site topography slopes slightly from the southeast to the northwest. Narragansett Bay and Coasters Harbor border the site along its northern edge. The northern shoreline is at an elevation slightly higher than the beach along the bay. Along the southern edge of the site is a curbed road (Taylor Drive) that likely deters any surface water runoff from flowing onto the site. Storm drains along this road direct runoff beneath OFFTA through a 24-inch reinforced concrete pipe. The runoff discharges into Coasters Harbor approximately 30 feet north of the northern shoreline. The stormwater outfall is shown on Figure 1-4. Surface water runoff (precipitation) from the site either evaporates, infiltrates into the site soils, ponds on-site, or flows directly into the Narragansett Bay. Very small ponded areas were observed on-site during periods of heavy rainfall.

Wetlands

Coasters Harbor Island is designated an upland area. Published maps do not indicate the presence of wetlands on the island (USDOI 1975).

3.3.4 Regional Groundwater Hydrogeology

The regional groundwater hydrogeology for NAVSTA Newport is presented below. Much of the regional information described in the IAS report (EEI 1983) was obtained from the Groundwater Map of the Prudence Island and Newport Quadrangles, Rhode Island (1964). Information from both references was used to describe the regional groundwater hydrogeology.

Many areas on Aquidneck Island, on which NAVSTA Newport is located, obtain their water supply from wells. Areas relying on groundwater are mostly on the east side of Middletown, but there are wells throughout the entire island. Most groundwater wells are used for domestic needs, although small industries and businesses use some wells.

Groundwater on Aquidneck Island is obtained from the unconsolidated glacial deposits of till and outwash and from the underlying Pennsylvanian bedrock. Throughout the area, depth to groundwater ranges from less than one foot to about 30 feet, depending upon the topographic location, time of year, and character of subsurface deposits. The average depth to the groundwater is around 14 feet on Aquidneck Island and moves from areas of high elevations to Narragansett Bay or the Sakonnet River.

Seasonal water level fluctuations are common in the area. During the early spring the water table rises due to recharge from snowmelt and rainfall. In late spring and summer, the water table usually declines because rainfall either evaporates or is used by plants before it can reach the water table. During autumn the water table generally rises.

The unconsolidated glacial deposits range in thickness from less than 1 foot near rock exposures to about 50 feet throughout Aquidneck Island. The glacial deposits consist mostly of till and outwash. In the NAVSTA Newport area, the glacial deposits are till with a thickness of less than 20 feet. At the time this map was produced, wells completed in the till were usually dug and ranged in depth from less than 10 feet to as much as 75 feet. The average depth for those wells was about 20 feet.

The yield of wells completed in the unconsolidated deposits varies, depending upon the type and thickness of the water-bearing deposits penetrated. Till can only yield small supplies, whereas, yields from outwash are usually much greater. Yields range from less than one to as much as 120 gallons per minute, as reported from a public supply well on Prudence Island. The upper limits of the referenced well yield are most likely for a well completed in outwash, not till. Under normal weather conditions, till wells yield a few hundred gallons of water per day and are adequate for domestic supplies. However, these wells are subject to going dry during seasonal or unusual droughts.

Bedrock wells in the area range from 14 to 1,300 feet in depth. The average depth for these bedrock wells is 135 feet. Yields from bedrock wells range from less than 1 to as much as 55 gallons per minute. Most bedrock wells yield less than 10 gallons per minute. The yields vary considerably in the bedrock over short distances because the joints and fractures that transmit water to the wells occur randomly. Joints and fractures are most numerous and widest near the top of the bedrock and become fewer and narrower with depth. Bedrock wells seldom go dry, but yields can be extremely low if not enough fractures and joints occur in the area of the well.

The chemical characteristics of the groundwater are similar throughout the area, and the water is generally satisfactory for most ordinary uses. Most groundwater in the area is soft or only moderately hard, with groundwater from till generally containing less mineral matter and being softer than groundwater from bedrock. Wells yielding water with a high iron content are scattered throughout the area, being most numerous around Newport and Middletown and the northern part of Portsmouth.

In scattered locations near the shoreline, over-pumping has led to salt water intrusion in some wells. Bedrock wells are not as easily contaminated with salt water as wells completed in unconsolidated deposits, but th chance of contamination increases as the depth of the well below sea level increases.

No wells were identified within the boundaries of NAVSTA Newport other than on Gould Island.

The groundwater at NAVSTA Newport is very shallow, being less than 10 feet below the surface in most areas. This shallow depth makes groundwater contamination at NAVSTA Newport very possible. Those pollutants that do find their way into the groundwater would migrate to the west and discharge into Narragansett Bay. NAVSTA Newport extends along the western shoreline of Aquidneck Island, and the groundwater only has to migrate a short distance before discharging into Narragansett Bay.

The soils occurring at NAVSTA Newport have a permeability that is moderate to moderately rapid, and do not restrict the vertical movement of water. The glacial till, from which these soils were derived, is generally less permeable than the overlying soils but does not represent a barrier to the vertical migration of water. Therefore, it is possible that any contaminant in these soils could be transported to the groundwater. There are also isolated areas where the bedrock occurs at the surface. Contamination is possible in these areas through the joints and fractures that commonly occur in the bedrock.

Information obtained from the NAVSTA Newport Phase I RIs indicated that, in general, groundwater on NAVSTA Newport flows from east to west towards Narragansett Bay. Depth to groundwater ranged from approximately 4 to 28 feet below ground surface at NAVSTA Newport sites investigated prior to 1994. Slug tests conducted on monitoring wells at these sites indicated that the hydraulic conductivity of the till unit encountered above the bedrock ranged from 0.22 to 0.44 feet per day and the upper bedrock hydraulic conductivity ranged from 0.029 to 0.21 feet per day. The RI report noted that bedrock test data produced hydraulic conductivity values higher than those normally attributed to shale (3.28×10^{-4} to 3.28×10^{-8} feet per day (Driscoll 1987).

3.3.5 Groundwater Classifications

RIDEM has classified groundwater in Rhode Island to protect and restore the quality of the state's groundwater resources for use as drinking water and other beneficial uses, and to assure protection of the public health and welfare, and the environment. The RIDEM Groundwater Quality Regulations were promulgated in May 1992 (Regulation 12-100-006) and amended in May 1995.

The groundwater beneath OFFTA has been classified by RIDEM as "GB" (see Figure 3-11). GB-classified groundwater resources are not suitable for public or private drinking water use. These resources may be found beneath highly urbanized areas with dense concentrations of industrial and commercial activity, or in the vicinity of permanent waste disposal sites for solid waste, hazardous waste or sewage sludge (RIDEM 1995).

3.3.6 Site Groundwater Hydrogeology

The following sections discuss the site groundwater hydrogeology based on data collected during the Phase I and II RI field investigations and the SRE field investigation.

3.3.6.1 Phase I and Phase II RI Site Groundwater Hydrogeology Findings

Groundwater Level, Flow Direction, and Tidal Influence

Groundwater levels were measured in the 14 monitoring wells installed during the Phase I and Phase II RI on four dates (January 4, 1994, February 22, 1994, May 12, 1994, and July 12, 1994). On July 12, 1994, groundwater level measurements were obtained from the wells during both high tide and low tide in the adjacent Narragansett Bay. A summary of the groundwater elevation data for both Phase I and Phase II is presented in Table 3-1. Groundwater table contour maps for each of the Phase II measurements are presented as Figures 3-5 through 3-9. Groundwater contour maps for the Phase I measurements are provided in Appendix H.

In general, each of the site groundwater contour maps indicates that the site groundwater is flowing to the north towards the adjacent Coasters Harbor and Narragansett Bay. In some areas of the site, groundwater flow direction is to the northwest or northeast; however, the primary direction of groundwater flow is to the north. This flow direction is consistent with the local land topography.

Continuous groundwater monitoring at the site in Phase I indicated the presence of tidal influence on site groundwater. The groundwater monitoring data from the tidal study is presented graphically in Appendix H. As expected, the greatest tidal effects were observed in the groundwater along the sites' shoreline at wells MW-2 and MW-4. No tidal effects were observed in wells MW-1, MW-3, or MW-5. Each of these wells is located further inland and a greater distance from Narragansett Bay. In Phase II, groundwater elevations were also obtained at low tide and high tide on July 12, 1994 to further assess the tidal effects on the site groundwater at each of the site wells. Consistent with the Phase I results and as shown in Table 3-1, the greatest tidal effects were again observed in shoreline wells (MW-2S, MW-2D, MW-4S, MW-10S, and MW-11R). With the exception of well MW-3S, the measured groundwater elevation differences from low to high tide at the other wells is considered negligible and likely the result of rounding differences in the water level readings.

Based on the groundwater elevation data obtained for the site and presented in Table 3-1, the highest groundwater elevations were generally observed in the winter and spring months of January, February, and May. Furthermore, the lowest observed groundwater elevations were generally observed in the summer and fall months of June, July, and September. These seasonal groundwater elevation trends are the most evident at wells MW-3S and MW-5S. Based on the Phase I site tidal study (see results in Appendix H) and the July low and high tide groundwater measurements, tidal effects are minimal. As expected, these seasonal trends in th groundwater elevations mirror the seasonal precipitation trends for the area (see regional precipitation data in Appendix I).

The average depth to groundwater across the site ranges from approximately 4 to 7 feet below grade (excluding the two mounded areas). As shown on the groundwater contour maps, the depth to groundwater decreases with proximity to the bay and harbor. With the exception of the two mounded areas, as shown on Figure 1-4, the site topography is fairly uniform in the central portion of the site while increasing slightly to the east and decreasing slightly to the west. In addition, given that the bedrock is very shallow in the eastern portion and a part of the central portion of the site, the groundwater table is within the bedrock in these areas. Thus, the screened interval of both the shallow overburden and several of the bedrock wells at the site intercept the groundwater table.

Hydraulic Conductivity and Transmissivity

Single well hydraulic conductivity tests (slug tests) were performed in 10 of the monitoring wells at the site (MW-2S, MW-2D, MW-4S, MW-6R, MW-7S, MW-8R, MW-9R, MW-10S, MW-11S, and MW-11R). Six of the wells are screened in the overburden soils at the site (MW-2S, MW-2D, MW-4S, MW-7S, MW-10S, and MW-11S). The remaining four wells (MW-6R, MW-8R, MW-9R, and MW-11R) are screened entirely within the bedrock at the site. A summary of the Phase II slug test results is presented in Table 3-2. The Phase I and Phase II RI slug test data and results are provided in Appendix I.

Rising head tests were conducted on six overburden wells. These wells are located across the site. All but one of these wells, MW-11S, are screened in the unconsolidated site soils which typically consist of a fine to m dium graded sand and silt with varying amounts of gravel and rock fragments. As shown in Table 3-2, the hydraulic conductivity values estimated for the unconsolidated soils at these five wells ranges from 0.74 ft/day (MW-2D) to 41 ft/day (MW-7S). The lowest unconsolidated hydraulic conductivity and transmissivity values were observed at well MW-2D, which is screened in a denser soil approximately 15 feet deeper than the other shallow overburden wells. The average hydraulic conductivity for shallow overburden wells MW-2S, MW-4S, MW-7S, and MW-10S, which are screened over similar geologic materials is approximately 15 ft/day (10^{-5} cm/sec). This is reasonable for the type of soil encountered at these locations. Calculated transmissivity values at these four overburden wells ranged from 24 ft^2/day (MW-4S) to 350 ft^2/day (MW-7S).

The remaining shallow overburden well, MW-11S, was also tested. MW-11S is screened in a mixture of fill materials consisting of sand, gravel, rock fragments, wood, concrete, and brick. As expected, a higher hydraulic conductivity (120 ft/day) and transmissivity (600 ft^2/day) were estimated for the unconsolidated fill materials at this well.

Rising head tests were conducted on each of the four bedrock wells. Three of the bedrock wells MW-11R, MW-8R, and MW-9R are located on site, whereas well MW-6R is located off site. All three on-site bedrock wells are screened in a competent conglomerate that consists of large cobbles interbedded with sandston and graywacke. The single off-site bedrock well is screened in gray shale. As shown in Table 3-2, the hydraulic conductivity values estimated for the three on-site bedrock wells range from 2.5 ft/day (MW-11R) to 91 ft/day (MW-8R). Based on the measured values, an average on-site bedrock hydraulic conductivity of approximately 36 ft/day (10^{-4} cm/sec) is estimated. These variations may be explained by the presence of fractures within the bedrock at the on-site well locations caused by blasting during the development of the site. At the off-sit bedrock well, MW-6R (screened in shale), lower values were estimated for the hydraulic conductivity (0.61 ft/day).

A slug injection or falling head test was also performed at well MW-11R for comparison to the rising head test well results. As shown in Table 3-2, the falling head test yielded a hydraulic conductivity of 1.4 ft/day as compared to the 2.5 ft/day value obtained at this well by the rising head test. Thus, the results from both of these tests on this well indicate a fairly consistent value for the hydraulic conductivity.

Vertical Hydraulic Gradients

Vertical hydraulic gradients were determined at the three sets of nested monitoring wells (MW-2S/D, MW-6S/R, and MW-11S/R) constructed during the Phase I and Phase II RI. Vertical hydraulic gradients are used to evaluate potential contaminant migration downward through an aquifer. Positive hydraulic gradients indicate a net upward flow component, and a negative gradient indicates a net downward flow component. An upward flow would tend to retard contaminant transport down through an aquifer, whereas a downward gradient provides a means by which contamination could migrate toward the bottom of the aquifer. Vertical gradients were calculated for the five groundwater elevation measurement dates for the nested well pairs at the site. This includes the on-site nests, MW-2S/MW-2D and MW-11S/MW-11R, and the off-site upgradient well nest MW-6S/MW-6R. Table 3-3 provides a summary of the calculated vertical hydraulic gradients.

Both positive and negative vertical gradients were observed in the groundwater at the well nests. At well nest MW-2, where both wells are screened in the unconsolidated overburden materials, positive or upward gradients, ranging from 0.0031 to 0.0322 ft/ft were consistently observed in the groundwater on all measurement dates. At well nests MW-6 and MW-11, where one well is screened in the overburden and the other is screened in the bedrock, both positive and negative vertical gradients were observed during the measurement events. As documented by the tidal study and water level measurements, there is little to no tidal influence at well MW-6, thus the observed changes in the vertical gradients are most likely due to the influence of seasonal precipitation. This conclusion is supported by the fact that at the off-site well MW-6, a slight negative or downward gradient was measured in the periods of greatest precipitation (January and February) and a slight positive or zero gradient was measured in the transitional and drier months (May and July). The measured vertical gradients at well nest MW-6 ranged from 0.0023 ft/ft to -0.004 ft/ft. At the other overburden/bedrock well nest, MW-11, the RI findings indicate the presence of a notable tidal influence (approximately 1-foot from low to high tide) in the bedrock at this location. This tidal influence is also evident in the vertical gradients observed at this well as compared to those observed at well nest MW-6 where the groundwater is not tidally influenced. During periods of high tide, a positive vertical gradient was observed at well nest MW-11, whereas, at low tide a negative gradient was present. The measured vertical gradients at well nest MW-11 ranged from 0.0289 ft/ft to -0.0451 ft/ft. Similar to the conditions at MW-6S/R, the seasonal influence of precipitation on the groundwater elevations at well nest MW-11 appears to affect the magnitude of the vertical gradients. A greater negative gradient was observed during low tide at well nest MW-11 in the drier month (July) than was observed near low tide in February, a wetter month. This increase in the negative gradient was a result of a drop of nearly 1 foot in the groundwater elevation in w ll MW-11R along with a very small elevation decrease in well MW-11S (approx. 0.2 feet) from February to July.

In summary, based on the groundwater elevations obtained from the wells at the site, there is a positive or downward gradient in the unconsolidated overburden materials at one location (MW-2) which ranged from 0.0031 ft/ft to 0.0322 ft/ft that was not observed to change seasonally or tidally. The vertical gradients observed between the overburden and bedrock indicate the presence of a seasonal variation from positive to negative (0.0023 ft/ft to -0.004 ft/ft) at inland location MW-6, which is not affected tidally. Greater positive and negative vertical gradient variations (0.0289 ft/ft to -0.0451 ft/ft) were observed at location MW-11 (along the shoreline), which is affected both seasonally and tidally.

Horizontal Hydraulic Gradients

Horizontal hydraulic gradients were determined from the Phase II RI water level measurements at the site. Horizontal gradients are used, along with the aquifer hydraulic conductivity and effective porosity, in estimating horizontal groundwater flow velocities, and hence the rate at which an aquifer may transport contaminant solutes. The horizontal gradient represents the change in hydraulic head, measured in feet, per horizontal foot of travel through the medium. Horizontal gradients were calculated for groundwater flow across three areas of the site using the groundwater contour maps generated for the site. Figures 3-5 through 3-9 show the groundwater contour maps and the areas for which horizontal hydraulic gradients were calculated (depicted by arrows on figures). Table 3-4 provides a summary of the calculated average horizontal hydraulic gradients for the site. An explanation of the method used to calculate the horizontal hydraulic gradients in provided in Appendix I.

Average horizontal hydraulic gradients were generally low (less than 2 percent) across the site, as would be expected over a relatively flat area. Across the eastern portion of the site, horizontal gradients were very similar for the water level measurement events and varied from 0.0089 ft/ft (July 12, 1994-high tide) to 0.0149 ft/ft (February 22, 1994). Horizontal gradients in the central portion of the site were also fairly consistent and similar to the eastern site values, ranging from 0.0081 ft/ft (July 12, 1994-high tide) to 0.0191 ft/ft (February 22, 1994). Slightly lower horizontal gradients were determined across the western portion of the site, ranging from 0.0046 ft/ft (July 12, 1992-low tide) to 0.0096 ft/ft (January 4, 1994).

Average Linear Velocities

The calculated average horizontal hydraulic gradients, along with hydraulic conductivity and effective porosity values were used to calculate average linear velocity values at the site. Table 3-4 provides a summary of the calculated average linear velocities for the site. To estimate average linear velocities, average hydraulic conductivity values were used for the three different areas of the site over which horizontal gradients and linear velocities were calculated. As is evident on the geologic cross sections, groundwater flow on the eastern and central portions of the site begins within the bedrock, and flows north into overburden soils as the bedrock dips downward to the north. The average linear velocities in these areas are based on average horizontal conductivities and porosities for the overburden. The average hydraulic conductivities calculated for each area are provided on the bottom of Table 3-4. An average effective porosity of 25 percent was used for the overburden.

As shown in Table 3-4, estimated average linear groundwater velocities range from 0.19 ft/day to 3.1 ft/day for the site. The greatest linear velocities are calculated in the eastern and western portions of the site where the highest hydraulic conductivities were estimated. Calculated average linear velocities for the groundwat r flow through the eastern portion of the site (MW-8R to MW-10S) range from 0.3 ft/day (July 12, 1994) to 0.5 ft/day (February 22, 1994). Average linear velocities calculated for the central portion of the site (MW-9R to MW-2S) range from 0.19 ft/day (July 12, 1994) to 0.46 ft/day (February 22, 1994). The estimated average linear velocities for the western portion of the site (MW-7S to MW-11S) range from 1.5 ft/day (July 12, 1994) to 3.1 ft/day (January 4, 1994). Overall, the estimated linear velocity values are consistent and fall within the range of anticipated linear velocities for the geologic units encountered at the site. It is important to note that th se calculated average linear velocity values are likely lower than the "true microscopic velocities" because water particles must travel along irregular paths that are longer than the linearized paths represented by the calculated average linear velocities (Freeze and Cherry, 1979).

3.3.6.2 SRE Site Groundwater Hydrogeology Findings

On July 11, 1997, groundwater levels were measured in each of the 16 monitoring wells as presented in Table 3-5. Groundwater level measurements were obtained during a rising tide over the span of 1.25 hours approximately 1.5 to 2.75 hours after low tide. These measurements, converted to elevations, were used to create the water table contours, which are presented in Figure 3-10. While no significant precipitation vents occurred during the water level measurement round, there was a heavy precipitation event the evening of July 9, 1999 that may have affected the groundwater flow pattern.

The water level elevations were reviewed and compared to the bedrock elevations (refer to Figure 3-4), for use in establishing the water table contours. Based on the review, the water level elevation was below the top of the bedrock surface in all of the bedrock monitoring wells, with the exception of MW-11R. At well cluster MW-6S/R the overburden well was essentially dry with only residual water detected in the sediment trap portion of the well. Therefore, bedrock wells MW-1R, MW-6R, MW-8R, and MW-9R were used in addition to the available overburden wells to create water table contours. The bedrock wells are located in the upper portion of the bedrock, which has been characterized as highly fractured and is believed to be hydraulically connected to the overburden materials.

As noted in the Phase I and II RI, Figure 3-10 indicates that the groundwater flows generally from the south to the north, or from the interior portion of Coasters Harbor Island towards Narragansett Bay and Coasters Harbor. The water table contours are steepest in the eastern half of the site and tend to spread out towards the west indicating a shallower gradient, which mimics site topography. Additionally, the change in gradient likely reflects a transition made as groundwater flows through fractured bedrock (MW-8R and MW-9R) into a thick deposit of porous overburden materials noted at MW-10S, MW-2S, MW-102, MW-3S, and MW-101.

A water table divide or possible mound was noted between MW-8R and MW-6R as reflected by the diverging 4.5-foot contour. Compared to water level elevations from July 11, 1997, the water level at MW-6R is lower than the surrounding data points and has been contoured accordingly. In all likelihood, MW-6R was completed in a bedrock formation different from the on-site wells. Additionally, this well has the lowest hydraulic conductivity of the five bedrock wells (Table 3-2). MW-6R is also situated in an area surrounded by pavement or other relatively impermeable surfaces such as roadways and a tennis court. The on-site wells (north of Taylor Drive) are in soil-covered areas with relatively high permeability.

In summary, the July 11, 1997 water level round may have been affected by the heavy precipitation event on July 9, 1997. The difference in groundwater recharge rates between the paved area adjacent to MW-6 and the grassed area of the site may have affected the groundwater flow directions at the site.

A positive vertical hydraulic gradient of 0.0355 ft/ft was determined for monitoring well cluster MW-11S/R based on groundwater level data collected on July 11, 1997 (Table 3-5). A vertical gradient was not calculated for MW-2S/D because the deep overburden well is screened through several different overburden units and into the upper bedrock. A vertical gradient was not calculated for MW-6S/R during the SRE investigation because the MW-6S well screen was not saturated at that time.

Bedrock groundwater contours were not presented because of the limited number of bedrock monitoring wells at or surrounding the site and the poor spatial distribution of the wells. All five of the data points are concentrated within the eastern half of the site and are somewhat aligned in a northwest to southeast direction, which would effect the geometry of the contours.

No additional hydraulic conductivity tests or tidal studies were conducted during the SRE investigation.

3.3.7 Area Water Use

Public water in the City of Newport and Town of Middletown is supplied and managed by the Newport Water Department. The Town of Portsmouth purchases water from the Newport Water Department but operates its own distribution system. Approximately two thirds of Portsmouth is serviced by public water with the remaining one third supplied water from private water wells. While no specific records exist as to private well use in the information reviewed, in general, the majority of private wells are reportedly located on the eastern portion of Aquidneck Island, primarily in Middletown (Personal Communication, Town of Portsmouth, 1992; Quinlan 1997).

The Newport Water Department receives its water supply from a series of seven surface water reservoirs located on Aquidneck Island and two surface water reservoirs (Tiverton and Fall River) on the mainland. The seven surface water reservoirs on Aquidneck Island are:

1. Lawton Valley Reservoir,
2. St. Marys Pond,
3. Sisson Pond,
4. Easton North Pond,
5. Easton South Pond,
6. Paradise or Nelsons Pond, and
7. Gardners Pond.

Each of these reservoirs is supplied water via rainfall and runoff and is not augmented by groundwater supply wells. The Newport Water Department stated that the safe yield of the reservoir system is approximately 11 to 13 million gallons per day (MGD). Water use in 1991 was 7.07 MGD, and adequate capacity reportedly exists for projected water usage on Aquidneck Island for the next 10 to 20 years, or more (Personal Communication, Newport Water Department, 1992). The Lawton Valley, Sisson Pond, St. Marys Pond, and the Easton North Pond surface water reservoirs are in the vicinity of NAVSTA Newport. However, OFFTA directly abuts Narragansett Bay and Coasters Harbor at an elevation of approximately 7 to 12 feet above MLW and the locations of the water supply reservoirs are at inland elevations greater than 40 feet above MLW. OFFTA does not lie within the watershed of any of the area water supply reservoirs.

The Prudence Island Utilities Company supplies groundwater to approximately 800 people on Prudence Island, Portsmouth, located east and offshore of the Melville area.

The locations of known public groundwater supply wells and surface water reservoirs within the vicinity of NAVSTA Newport are shown on Figure 3-11. The locations of groundwater supply wells were obtained from the February 1992 RIDEM Ground Water Section Facilities Inventory map for the Prudence Island quadrangle (USGS 1975). The map shows the locations of known public groundwater supply wells, in addition to known or suspected sources of groundwater contamination. RIDEM Ground Water Section personnel indicated that the location of the supply wells within the Prudence Island Quadrangle had been field verified by RIDEM personnel.

Current actual locations of private bedrock wells in the area of the NAVSTA Newport could not be determined. According to the Newport Water Department, several residential lots along portions of Browns Lane, Oliphant Lane, and Jepson Lane (on the west side of Middletown) are not connected to a public water supply pipeline. The homes on these lots likely rely on private water sources for potable water supply needs (Jalkut 1997). Browns Lane and Oliphant Lane are several miles northeast of OFFTA, at inland elevations greater than 50 feet above MLW.

Private wells are reported to withdraw water from till, bedrock, and stratified-drift aquifers. Of these aquifers, bedrock is considered the most reliable source of groundwater, and well yields are commonly sufficient for domestic supplies (Johnston, U.S.G.S., undated).

Current locations of known community and non-community wells in the area of the NAVSTA Newport were not determined.

4.0 NATURE AND EXTENT OF CONTAMINATION

This section of the report presents a discussion of the nature and extent of contamination detected in site media during the investigations described in Section 2.0. Separate sections discuss soil (surface soil and subsurface soil), groundwater, storm sewer water, sediment, and biota. Each section provides a brief summary of the investigations conducted for the subject media, followed by a separate discussion for each of the chemical compound classes considered for that media. Chemical classes evaluated include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), metals, dioxins/furans, total petroleum hydrocarbons (TPH), and visible petroleum. The chemical class discussions contain summaries of analytical results along with comparisons of detected contaminant levels to applicable standards, and/or background concentrations.

Samples collected for VOCs, SVOCs, pesticides/PCBs, dioxins/furans, and metals were analyzed according to U.S. EPA Contract Laboratory Program (CLP) protocols. In some cases, such as TPH, CLP protocols did not exist. Non-CLP analyses were performed according to established EPA protocols current at the time of the investigation. All the sample data were validated according to established US EPA Region I data validation guidelines. The validated analytical data are presented in Appendices K, L, M, N and P.

4.1 SOIL ASSESSMENT

This section of the report presents a discussion on the nature and extent of soil contamination detected at the OFFTA site. The discussion addresses surface soils and subsurface soils and is presented in order by the following chemical compound classes: VOCs, SVOCs, pesticides/PCBs, metals, dioxins/furans, TPH, and visible petroleum. The contaminant discussion for each section presents general observations regarding soil contamination along with comparisons to applicable soil quality criteria and background concentrations established for the site.

Soil contaminant concentrations were compared to the Residential Direct Exposure Criteria and the GB Leachability Criteria established in the RIDEM Remediation Regulations (1996). In addition, metals concentrations in surface and subsurface soils were compared to background soil metals concentrations established in the OFFTA background soil investigation conducted by TtNUS in early 2000 and described in Section 2.6 of this report. Summary tables detailing the frequency of detection, maximum and minimum detected concentrations, average concentrations, and comparisons to RIDEM Residential Direct Exposure Criteria and background concentrations for surface and subsurface soil are presented on Tables 4-1 and 4-2.

The soil samples discussed in this section were collected during the surface soil sampling, soil boring, and test pit activities conducted as part of the Phase I, Phase II, Phase III, and Source Removal Evaluation site investigations. The surface soil sample locations for all the investigations are shown on Figure 4-1. The subsurface soil sample locations are shown on Figure 4-2.

A total of 80 surface soil samples (excluding duplicates) were collected during the various OFFTA site investigations. These investigations included 11 samples collected during the Phase I and Phase I–Supplemental investigations, 37 collected during the Phase II site investigation, and 32 collected during the Phase III investigation. The Phase I samples included two samples (SS-2 and SS-7) collected at the same location at different times. The Phase II surface soil samples included 20 collected using hand tools (augers or shovels) and 17 collected from the 0- to 2-foot interval (0- to 1-foot for analyses) of test borings and monitoring well borings during drilling. The Phase III samples were all collected using hand tools.

A total of 58 subsurface soil samples (excluding duplicates) were collected during the OFFTA site investigations. This included 21 samples collected during the Phase I investigation, 23 collected during the Phase II investigation, and 14 collected during the Source Removal Evaluation. The Phase I subsurface soil samples included 15 samples collected from 7 on-site soil borings, 4 samples collected from 2 on-site monitoring well borings, and 2 samples collected from a the boring for monitoring well MW-5, located approximately 75 feet south of the site. The Phase II subsurface soil samples included 8 samples collected from 3 test pits, 10 samples collected from 8 on-site soil borings, 4 samples collected from 4 on-site monitoring well borings, and 1 sample collected from the boring for off-site monitoring well MW-6. The Source Removal Evaluation samples included 2 samples collected from 2 monitoring well borings and 12 samples collected from 12 test pits. Additionally, an oily sludge sample (TP1-1) collected from a test pit during Phase II is discussed within the subsurface soil results discussions.

The Phase II samples included 3 surface samples (SS-29, SS-30, and SS-31) collected from a park located southeast of the site and 1 sample collected from the boring for monitoring well MW-6, located approximately 200 feet south of the site. These off-site soil samples were intended as "background" samples. However, based on current site investigation methods, these samples are not considered suitable for use as background samples due to their relatively close proximity to the site and the possibility that they were affected by site activities (by direct discharge of contaminants or deposition of airborne contaminants). As a result, these samples will not be discussed in the discussions of site soil contamination or background concentrations; however, the results from these samples are included in the analytical data tables in Appendix L.

4.1.1 Volatile Organic Compounds (VOCs)

This section presents a discussion of the nature and extent of VOC contamination detected in OFFTA surface and subsurface soils.

Surface Soils

During the various OFFTA site investigations, 67 surface soil samples were collected for VOC analysis.

The VOC analysis of the surface soil samples indicates the presence of very low levels (low ppb) of several VOCs in some of the samples. Those VOCs detected include methylene chloride, acetone, bromomethane, 2-butanone, carbon disulfide, chloromethane, 1,2-dichloroethene (1,2-DCE), 2-hexanone, 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), tetrachloroethene (PCE), toluene, vinyl chloride, and xylenes.

Acetone, 2-butanone, and methylene chloride were detected frequently throughout the site. Acetone was detected in 23 samples at concentrations ranging from 2 ppb to 320 ppb. The maximum acetone concentration was detected at SS-325. 2-butanone was detected in 15 samples at concentrations ranging from 1 ppb to 13 ppb. The maximum 2-butanone concentration was detected at SS-306. Methylene chloride was detected in 37 samples at concentrations ranging from 1 ppb to 4 ppb. The maximum methylene chloride concentration was detected at SS-324.

The remaining detected VOCs were detected infrequently. PCE was detected in samples B10-1 and SS-23 at concentrations of 16 ppb and 1 ppb, respectively. Sample B10-1 was located in the western portion of the site. Sample SS-23 was located in the northeast portion of the site adjacent to Coasters Harbor. PCE was also detected at a concentration of 2 ppb in sample SS-02 collected from the childcare playground area. 1,1,1-TCA was detected at 2 ppb in sample SS-23. TCE was detected at 1 ppb in sample SS-17, located southwest of the baseball field. The compounds 1,2-DCA and vinyl chloride were detected at concentrations of 17 ppb and 3 ppb, respectively, in sample B14-1 collected from the central mound area.

All detected VOC concentrations were less than RIDEM Residential Direct Exposure Criteria for soils and the RIDEM GB Leachability Criteria.

Subsurface Soils

During the various OFFTA site investigations, 53 subsurface soil samples were collected for VOC analysis.

The subsurface soil sample VOC results indicate the presence of very low levels (low ppb) of several VOCs. Those VOCs detected include methylene chloride, 2-butanone, carbon disulfide, chloroethane, ethylbenzene, toluene, and xylenes. The subsurface soil sample VOC results indicate the presence of several VOCs known to be common laboratory solvents. These include methylene chloride, 2-butanone, and toluene. Toluene, xylenes, and methylene chloride were detected frequently in samples collected throughout the site. Maximum concentrations of each were detected in samples collected from the central portion of the site. Toluene was detected in ten samples at concentrations ranging from 1 ppb to 67 ppb. The maximum toluene concentration was detected at B-6. Total xylenes were detected in five samples at concentrations ranging from 2 ppb to 1,200 ppb. The maximum xylenes concentration was also detected at B-6. Methylene chloride was detected in six samples at concentrations ranging from 1 ppb to 1,800 ppb. The maximum methylene chloride concentration was detected at TP-11.

The remaining detected VOCs were detected infrequently (in less than ten percent of samples). 2-butanone was detected in three samples at concentrations ranging from 3 ppb to 1,100 ppb. Carbon disulfide was detected in three samples at concentrations ranging from 3 ppb to 11 ppb. The maximum concentration was detected at B-5. Ethylbenzene was detected in three samples at concentrations ranging from 89 ppb to 630 ppb. The maximum concentration was detected at MW-102. Chloroethane was detected in one sample at 1 ppb at B-14-2. Carbon disulfide and chloroethane are also solvents and their low level (low ppb) presence in samples is likely attributed to laboratory contamination of the samples or a sample container contaminant.

All detected VOC concentrations were less than RIDEM Residential Direct Exposure Criteria for soils and the RIDEM GB Leachability Criteria (RIDEM 1996).

4.1.2 Semivolatile Organic Compounds (SVOCs)

This section presents a discussion of the nature and extent of SVOC contamination detected in OFFTA surface and subsurface soils.

Surface Soils

During various OFFTA site investigations, 71 surface soil samples were collected and submitted for TCL SVOC analysis.

The results of the SVOC surface soil analysis indicate that SVOCs are present across the entire site. Of the 71 surface soil samples collected, only five samples contained no detectable concentrations of SVOCs. These five samples include SS-16 located on the ball field, SS-317 and SS-318 located in the childcare playground area, and samples SS-3 and B14-1 located on top of the central mound. Of the SVOCs detected in the surface soil samples, polynuclear aromatic hydrocarbons (PAHs), a subset of SVOCs, were the most prevalent. PAH compounds were present in 62 surface soil samples at concentrations ranging from 36 ppb to 15,000 ppb. Carcinogenic PAH (CaPAH) concentrations detected at these locations ranged from 36 ppb to 9,700 ppb. The benzo(a)pyrene and dibenz(a,h)anthracene surface soil sample results are presented on Figure 4-1. The highest concentrations of these and other CaPAHs were detected in several of the surface soil samples collected adjacent to Coasters Harbor. Concentrations of detected CaPAHs, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene, particularly in this area of the site were greater than RIDEM Residential Direct Exposure Criteria for soils.

Other SVOCs detected in the site surface soils include phthalate esters, dibenzofuran, carbazole, 4-chloro-3-methylphenol, n-nitrosodiphenylamine, hexachlorobenzene, and phenol. These compounds were detected infrequently across the site and at relatively low concentrations (the detected ranges are presented below). Phthalate esters detected in the site surface soils include bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and di-n-octyl phthalate. These phthalate esters are found mostly in surface soil samples collected from the north central and playground areas of the site. Bis(2-ethylhexyl)phthalate was detected in 15 surface soil samples at concentrations ranging from 42 ppb to 3,200 ppb. Di-n-butylphthalate was detected in 17 surface soil samples at concentrations ranging from 38 to a maximum of 170 ppb. Di-n-octyl phthalate was only detected in one sample at 54 ppb. Dibenzofuran was detected in eight surface soil samples collected from across the site at concentrations ranging from 39 ppb to a maximum of 650 ppb in sample SS-6. Carbazole was detected in nine of the surface soil samples collected from across the site at concentrations ranging from 40 ppb to a maximum of 930 ppb in sample SS-314. Hexachlorobenzene was detected in two of the surface soil samples at 43 ppb and 210 ppb. 4-chloro-3methylphenol was detected in three of the surface soil samples at concentrations ranging from 68 ppb to a maximum of 140 ppb. Phenol and n-nitrosodiphenylamine were detected in only one surface soil sample each. Phenol was detected in surface soil sample M-8-1 at a concentration of 60 ppb, and n-nitrosodiphenylamine were detected in sample B12-1 at concentrations of 150 ppb. All detected SVOC concentrations other than CaPAHs were less than RIDEM Residential Direct Exposure Criteria for soils.

<u>Subsurface Soils</u>

During various OFFTA site investigations, 49 subsurface soil samples were collected and submitted for TCL SVOC analysis. The results of the SVOC subsurface soil analysis indicate that SVOCs are present across the entire site. Of the 49 subsurface soil samples collected, only two samples contained no detectable concentrations of SVOCs. These two samples include TP-02 located at the southeast edge of the site, and TP2, located at the edge of the central mound. Of the SVOCs detected in the subsurface soil samples, PAHs, a subset of SVOCs, were the most prevalent. PAH compounds were present in subsurface soil samples at concentrations ranging from 38 ppb to 16,000 ppb. CaPAH concentrations detected at these locations ranged from 47 ppb to 4,000 ppb. The benzo(a)pyrene subsurface soil sample results are presented on Figure 4-2. The highest concentrations of this and other CaPAHs were detected in several of the subsurface soil samples collected adjacent to Coasters Harbor. Concentrations of detected CaPAHs, including benzo(a)antracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene, particularly in this area of the site were greater than RIDEM Residential Direct Exposure Criteria for soils.

Other SVOCs detected in the site subsurface soils include phthalate esters, dibenzofuran, carbazole, 4,6-dinitro-2-methylphenol, 9H-carbazole, benzoic acid, hexachlorobenzene, and phenol. These compounds were detected infrequently across the site and at relatively low concentrations (the detected ranges are presented below). Phthalate esters detected in the site subsurface soils include bis(2-ethylhexyl)phthalate, butylbenzylphthalate, and di-n-butylphthalate. Bis(2-ethylhexyl)phthalate was detected in three subsurface soil samples at concentrations ranging from 44 ppb to 110 ppb. Butylbenzylphthalate was detected in one subsurface soil sample at 120 ppb. Di-n-butylphthalate was detected in three subsurface soil samples at concentrations ranging from 56 to a maximum of 1,400 ppb. Dibenzofuran was detected in 11 subsurface soil samples collected from across the site at concentrations ranging from 86 ppb to a maximum of 4,000 ppb in sample TP-15. 9H-carbazole was detected in six subsurface soil samples collected from across the site at concentrations ranging from 69 ppb to a maximum of 220 ppb in sample B-15-3. Phenol was detected in three subsurface soil samples at concentrations ranging from 250 ppb to a maximum of 490 ppb in samples B-7 and MW-2. Carbazole was detected in one subsurface soil sample at 170 ppb in sample TP-5. Hexachlorobenzene was detected in one of the subsurface soil samples at 370 ppb in sample B-14-2. 4,6-dinitro-2-methylphenol was detected in one of the subsurface soil samples at 320 ppb. Benzoic acid was detected in one of the subsurface soil samples at 48 ppb. All detected SVOC concentrations other than CaPAHs were less than RIDEM Residential Direct Exposure Criteria for soils.

Results of the SVOC analysis conducted on the oily sludge sample (TP1-1) collected from a pipe encountered test pit TP-1 during the Phase II investigation indicate that the oily sludge has elevated concentrations of total PAHs and bis(2-ethylhexyl)phthalate. Total PAHs detected in the oily sludge sample totaled 156,900 ppb, of which 79,700 ppb were total carcinogenic PAHs. The concentration of bis(2-ethylhexyl)phthalate detected in the sample was 12,000 ppb. These results are presented as TP-11 in Appendix L-3.

4.1.3 Pesticides/PCBs

This section presents a discussion of the nature and extent of pesticide and PCB contamination detected in OFFTA surface and subsurface soils.

Surface Soils

During the various OFFTA site investigations, 39 surface soil samples were collected for pesticides/PCBs analysis.

Pesticides were detected in all of the surface soil samples collected at the site. All but two (delta-BHC and toxaphene) of the twenty TCL pesticides were detected in at least one of the surface soil samples. In many instances, however, the detected pesticide concentrations were very low (ppt to ppb) estimated concentrations ("J" qualifier) reported at levels lower than the analytical reporting limits. Given the widespread presence of pesticides in the surface soil samples, an overall relative evaluation of the pesticide surface soil data was performed to locate samples having some of the highest individual pesticide concentrations. This review identified several pesticides as the most frequently detected, including dieldrin, 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, alpha-chlordane, gamma-chlordane, endosulfan II, endrin, and endrin aldehyde. Some of the highest overall pesticides levels were detected in samples a few samples scattered across the site including SS-17, B14-1, M9-1, and SS-14.

RIDEM provides direct exposure criteria for soils for only two pesticides, dieldrin and chlordane. Concentrations of these contaminants in surface soil samples do not exceed the criteria.

PCBs (Aroclor 1254) were detected in only two surface soil samples, sample SS-01 at 80 ppb from the eastern end of the site and sample MW10-1 at a concentration of 530 ppb, collected in the northeast portion of the site near the pavilion area. The concentrations of PCBs detected at these locations are well below the RIDEM Residential Direct Exposure Criteria for soils of 10 ppm for PCBs.

Subsurface Soils

During the various OFFTA site investigations, 33 subsurface soil samples were collected for pesticides/PCBs analysis.

Pesticides were detected in some of the subsurface soil samples collected at the site. All but four (aldrin, beta-BHC, endrin ketone, and toxaphene) of the twenty TCL pesticides were detected in at least one of the subsurface soil samples. In many instances, however, the detected pesticide concentrations were very low (ppt to ppb) estimated concentrations ("J" qualifier) reported at levels lower than the analytical reporting limits. This review identified several pesticides as the most frequently detected, including 4,4'-DDE, 4,4'-DDD, 4,4'-DDT, endosulfan II, endrin, and heptachlor epoxide. Some of the highest overall pesticides levels were detected in samples M-11-2 and B-15-3.

RIDEM provides direct exposure criteria for soils for only two pesticides, dieldrin and chlordane. Concentrations of these contaminants in subsurface soil samples do not exceed the criteria.

PCBs (Aroclors 1254 and 1260) were detected in only three subsurface soil samples. Aroclor 1254 was detected in sample TP3 at 95 ppb from the northern edge of the central mound and sample B-15-3 at a concentration of 190 ppb, collected in the central mound area. Aroclor 1260 was detected in sample B-17-2 at 39 ppb from the childcare playground area. Table 4-2 presents a comparison of the PCB concentrations detected in the site subsurface soils with the RIDEM soil action level. The concentrations of PCBs detected at these locations are well below the RIDEM Residential Direct Exposure Criteria for soils of 10 ppm for PCBs.

4.1.4 Metals

This section presents a discussion of the nature and extent of metals contamination detected in OFFTA surface and subsurface soils.

Surface Soils

During the various OFFTA site investigations, 76 surface soil samples were collected and analyzed for metals.

Numerous metals were detected in the surface soil samples collected at the site. The metals most common to the surface soil samples collected on the site include aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, silver, vanadium, and zinc. Metals detected infrequently in the surface soil samples include antimony (10 samples), cadmium (3 samples), selenium (8 samples), and sodium (7 samples). Thallium and cyanide were not detected in any of the surface soil samples. A summary of the concentration ranges for the metals detected in the surface soil samples is provided in Table 4-1.

To evaluate the inorganic analyte soil data, the inorganic analyte levels detected in the surface soil samples were compared with site-specific, off-site background surface soil sample data. A summary of the site-specific background surface soil sample inorganic compound results is provided in Appendix P. An overall comparison of the inorganic analyte concentration ranges detected in the surface soil samples to the background lev ls is provided in Table 4-1.

An evaluation of the metals surface soil data indicates that concentrations of most metals were detected in surface soil samples at concentrations greater than background concentrations. Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, vanadium, and zinc were detected at concentrations greater than background concentrations in some samples. Arsenic, magnesium, and potassium were the metals detected most frequently at concentrations greater than background concentrations. Arsenic was detected at concentrations greater than background concentrations in 49 samples. The highest arsenic concentrations were detected in samples collected from the central portion of the site including the edge of the central mound. Magnesium was detected at concentrations greater than background concentrations in 31 samples. Potassium was detect d at concentrations greater than background concentrations in 42 samples. Aluminum, barium, cadmium, mercury, and nickel exceed background concentrations in 3 or less samples each. Antimony, chromium, iron, vanadium, and zinc were detected at concentrations greater than background concentrations in less than ten samples each.

Detected concentrations of metals were compared to RIDEM Residential Direct Exposure Criteria for soils. Detected concentrations of arsenic, beryllium, lead, and manganese exceeded their respective RIDEM Residential Direct Exposure Criteria for soils. Arsenic concentrations exceeded the RIDEM criteria in 73 of the 76 samples analyzed. Beryllium concentrations exceeded the RIDEM criteria in 18 samples. Lead concentrations exceeded the RIDEM criteria in 2 samples. Manganese concentrations exceeded the RIDEM criteria in 11 samples. The arsenic surface soil sample results are presented on Figure 4-1.

<u>Subsurface Soils</u>

During the various OFFTA site investigations, 50 subsurface soil samples were collected and analyzed for metals.

Numerous metals were detected in the subsurface soil samples collected at the site. The metals most common to the subsurface soil samples collected on the site include aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc. Metals detected less frequently in the subsurface soil samples include antimony (9 samples) and cadmium (11 samples). Silver, thallium, and cyanide were not detected in any of the subsurface soil samples. A summary of the concentration ranges for the metals detected in the subsurface soil samples is provided in Table 4-2.

To evaluate the inorganic analyte soil data, the inorganic analyte levels detected in the subsurface soil samples were compared with site-specific, off-site background subsurface soil sample data. A summary of the site-specific background subsurface soil sample inorganic compound results is provided in Appendix P. An overall comparison of the inorganic analyte concentration ranges detected in the subsurface soil samples to the background levels is provided in Table 4-2.

An evaluation of the metals subsurface soil data indicates that concentrations of most metals were detected in subsurface soil samples at concentrations greater than background concentrations. Aluminum, antimony, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, vanadium, and zinc were detected at concentrations greater than background concentrations in some samples. Barium, calcium, copper, lead, potassium, and zinc were the metals detected most frequently at concentrations greater than background concentrations. Barium was detected at concentrations greater than background concentrations in 29 samples. Calcium was detected at concentrations greater than background concentrations in 36 samples. Copper was detected at concentrations greater than background concentrations in 23 samples. Lead was detected at concentrations greater than background concentrations in 39 samples. Potassium was detected at concentrations greater than background concentrations in 11 samples. Zinc was detected at concentrations greater than background concentrations in 13 samples. Aluminum, arsenic, chromium, cobalt, magnesium, nickel, and vanadium exceed background concentrations in 3 or less samples each. Antimony, iron, and manganese were detected at concentrations greater than background concentrations in less than ten samples each.

Detected concentrations of metals were compared to RIDEM Residential Direct Exposure Criteria for soils. Detected concentrations of antimony, arsenic, beryllium, lead, and manganese exceeded their respective RIDEM Residential Direct Exposure Criteria for soils. Arsenic concentrations exceeded the RIDEM criteria in 48 of the 50 samples analyzed. Antimony concentrations exceeded the RIDEM criteria in 3 samples. Beryllium concentrations exceeded the RIDEM criteria in 2 samples. Lead concentrations exceeded the RIDEM criteria in 17 samples. Manganese concentrations exceeded the RIDEM criteria in 23 samples. The arsenic subsurface soil sample results are presented on Figure 4-2.

4.1.5 Dioxins and Furans

This section presents a discussion of the nature and extent of dioxin/furan contamination detected in OFFTA surface and subsurface soils.

Surface Soil

During the various OFFTA site investigations seven surface soil samples were collected and analyz d for dioxins and furans.

In order to evaluate the dioxins/furans data, 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (2,3,7,8-TCDD) toxicity equivalents (TEQs) were calculated for each of the seven samples. Consistent with US EPA guidance, the calculation of TEQs equates all of the detected dioxins/furans results with the most known toxic dioxin isomer 2,3,7,8-TCDD. The data indicates that the 2,3,7,8-TCDD equivalents for the seven samples range from 0.00075 to 0.016 ppb. These levels are much lower than the commonly applied US EPA guidance level of 1 ppb for dioxin (2,3,7,8-TCDD) in residential soils.

Subsurface Soil

During the various OFFTA site investigations no subsurface soil samples were collected and analyzed for dioxins and furans.

4.1.6 Total Petroleum Hydrocarbons

This section presents a discussion of the nature and extent of TPH contamination detected in OFFTA subsurface soils. Analysis for TPH was conducted only during the Source Removal Evaluation (SRE), and only for subsurface soils. Subsurface soil samples analyzed for TPH during this investigation included one soil sample from each of 12 test pits (TP-02, TP-05, TP-06, TP-07, TP-08, TP-11, TP-12, TP-13, TP-14, TP-15, TP-16, and TP-17) and each of the two monitoring well borings (MW-101/SB-1 and MW-102/SB-2) advanced during the SRE. At each test pit and boring, the sample selected for laboratory analysis was the one containing the highest FID results or the strongest evidence of oil staining. In most cases, the sample depth was 5 to 8 feet bgs.

TPH is present throughout the site subsurface soils. Of the 14 subsurface samples analyzed for TPH, only three samples (TP-05, TP-07, TP-08) did not contain detectable concentrations. TPH concentrations ranged from 130 J mg/kg (TP-06) to 21,000 mg/kg (TP-15). The highest TPH concentration (21,000 J mg/kg) was detected in a subsurface soil sample collected from TP-15 at 5-6 feet bgs. TP-15 was excavated approximately 25-30 feet south of the shoreline.

Compared to the RIDEM soil objectives for TPH, OFFTA soils exceeded the residential direct exposure criterion (500 mg/kg) in 8 of 14 samples analyzed and exceeded the GB leachability criterion (2500 mg/kg) in 7 of 14 samples analyzed. TPH concentrations above the direct exposure criteria of 500 mg/kg ranged from 1900 mg/kg to 21,000 mg/kg in TP-11 through TP-16, MW-101, and MW-102. These locations are shown in Figure 4-3. TPH concentrations above the GB leachability criteria of 2,500 mg/kg ranged from 3,750 J mg/kg to 21,000 mg/kg in TP-11 through TP-16 and MW-102. TPH concentrations above the State criteria were detected at depths ranging from approximately 3 feet bgs to 11 feet bgs.

4.1.7 Observed Petroleum Contamination

This section presents a discussion of the extent of petroleum-stained soils and petroleum odors observed during the drilling and test-pitting programs conducted during the Phase I, Phase II and Source Removal Evaluation investigations.

Based on observations during the test pit and drilling programs, visible petroleum contamination was primarily observed in the central portion of the site, from Taylor Drive to Coasters Harbor as shown on Figure 4-3. Soil contaminated by petroleum was generally observed at or immediately above the water table.

Petroleum-contaminated soils were visibly evident at the following TRC sampling locations, and at the noted depths bgs: B-2 (6-8 feet); B-3 (8-10 feet); B-5 (4-6 feet); B-8 (13.6-14 feet); MW-2S (4-8 feet); MW-3 (4-8 feet); TP2 (7-8 feet); and TP3 (7-8 feet). Petroleum odors, but no visible contamination, were detected in B-4 (4-12 feet); B-6 (4-12 feet); B-7 (5-10 feet); B-12 (4-6 feet); B-13 (4-18 feet); B-15 (10-12 feet); B-16 (6-14 feet); MW-4S (5-10 feet); MW-5S (12 feet); MW-2D (14-16 feet); MW-7S (6-10 feet); MW-10S (8-10 feet); MW-11S (8-10 feet); and MW-11R (8-10 feet).

Petroleum-contaminated soils were observed (and corroborated by the TPH chemical analysis) at the following Source Removal Evaluation test pit locations, and at the noted depths bgs: TP-11 (5.0 feet); TP-13 (7.0 feet); TP-14 (4.0 feet); TP-15 (4.5 feet); and TP-16 (10.0 feet). Petroleum odors, but no visible contamination, were detected in TP-17.

Petroleum-contaminated soils were observed (and corroborated by TPH chemical analysis) at depths ranging from 6 to 11 feet bgs in the Source Removal Evaluation soil boring MW-101, and from 5 to 16 feet bgs in soil boring MW-102.

4.2 GROUNDWATER ASSESSMENT

The following sections discuss the presence and nature of contamination detected in the site groundwater samples. The groundwater assessment discussion is presented in the order of the following chemical compound classes: VOCs, SVOCs, pesticides/PCBs, and metals. Groundwater contaminant levels were compared to the GB Groundwater Objectives for GB aquifers established in the RIDEM Remediation Regulations, and to contaminant levels detected in three off-site upgradient monitoring wells.

Contaminant-specific comparisons of detected levels to RIDEM groundwater standards and upgradient monitoring wells are presented in Table 4-3. RIDEM GB Groundwater Objectives for GB aquifers are being used for the purpose of this assessment. In accordance with RIDEM's Rules and Regulations for Groundwater Quality (August 1996), groundwater beneath Coasters Harbor Island (locality of former OFFTA site) is classified GB. Groundwater classified GB is presumed not suitable for use as a current or potential source of drinking water, and is subject to the GB Groundwater Objectives listed in Table 4 of the RIDEM Remediation Regulations (amended August 1996).

The groundwater samples discussed in this section were collected during the groundwater sampling, activities conducted as part of the Phase I, Phase II, and Source Removal Evaluation site investigations. The groundwater sample locations for all the investigations are shown on Figure 4-4.

A total of 34 groundwater samples (excluding duplicates) were collected during the various OFFTA site investigations. These investigations included five shallow monitoring wells sampled during the Phase I investigation; nine shallow monitoring wells screened within the overburden material, one deep well screen on top of the bedrock surface, and four monitoring wells screened within the bedrock material sampled during the Phase II site investigation; and two shallow monitoring wells and 13 existing monitoring wells sampled during the Source Removal Evaluation investigation.

Thirty-four groundwater samples were analyzed for the full TCL/TAL. Fourteen monitoring wells were analyzed for cyanide and total chloride. Fifteen samples were analyzed for TPH. In addition, groundwater from nine monitoring wells was sampled for dissolved TAL metals analysis. Summary tables detailing the frequency of detection; maximum and minimum detected concentrations; average concentrations; and comparisons to RIDEM GB Groundwater Objectives for GB aquifers and upgradient concentrations for filtered and unfiltered groundwater are presented on Table 4-3.

4.2.1 Volatile Organic Compounds (VOCs)

This section presents a discussion of the nature and extent of VOC contamination detected in OFFTA groundwater.

During the various OFFTA site investigations, 25 groundwater samples were collected for VOC analysis.

The VOC analysis of the groundwater samples indicates the presence of very low levels (low ppb) of VOCs in a few of the samples. Those VOCs detected include benzene, carbon disulfide, chloroform, and ethylbenzene. Carbon disulfide, chloroform, and ethylbenzene were each detected only once. Benzene was detected twice. Both carbon disulfide and chloroform are used as laboratory solvents and may be a result of laboratory contamination.

All detected VOC concentrations were less than RIDEM GB GW Objective.

Groundwater from several of the site shallow monitoring wells had a noticeable petroleum-like odor. These monitoring wells include MW-2S, MW-3S, MW-10S, and MW-11S.

4.2.2 Semivolatile Organic Comp unds (SVOCs)

This section presents a discussion of the nature and extent of SVOC contamination detected in OFFTA groundwater.

During various OFFTA site investigations, 27 groundwater samples were collected and submitted for TCL SVOC analysis.

The results of the SVOC groundwater analysis indicate that SVOCs are present in groundwater at the site. Of the SVOCs detected in the groundwater samples, PAHs, a subset of SVOCs, were the most prevalent. Acenapthene, fluorene, and phenanthrene were the most frequently detected PAHs. PAH compounds were present in 10 groundwater samples at concentrations ranging from 0.5 ppb to 190 ppb. CaPAH concentrations detected at these locations ranged from 0.8 ppb to 3 ppb. The highest concentration of each PAH was detected in MW-2S located in the northern portion of the site. The concentrations of benzo(a)pyrene det cted in MW-2S, MW-2, and MW-11S exceed the federal MCLs for this compound of 0.2 ppb. These are the only locations with detected benzo(a)pyrene concentrations in groundwater. RIDEM does not provide GB groundwater objectives for SVOCs. The groundwater from MW-2S, MW-3S, MW-10S, MW-11S had a noticeable petroleum-like odor.

Other SVOCs detected in the site groundwater include phthalate esters, dibenzofuran, carbazole, and phenol. These compounds were detected infrequently across the site and at relatively low concentrations (the detected ranges are presented below). Phthalate esters detected in the site groundwater include bis(2-ethylhexyl)phthalate, di-n-butylphthalate, and diethylphthalate. These phthalate esters are found mostly in groundwater samples collected from the north central and playground areas of the site. Bis(2-ethylhexyl)phthalate was detected in six groundwater samples. Monitoring well MW-2S contained bis(2-ethylhexyl)phthalate at a concentration of 740 ppb, exceeding the federal MCLs for this compound of 6 ppb. Bis(2-ethylhexyl)phthalate was also detected in the groundwater samples collected from monitoring wells MW-1S, MW-2S, MW-8R, MW-9R, and MW-10S at concentrations ranging from 0.5 ppb to 6 ppb. Di-n-butyl phthalate was detected in monitoring wells MW-1S, MW-8R, MW-9R, and MW-10S at concentrations ranging from 0.9 ppb to 2 ppb, while diethylphthalate was only detected in monitoring well MW-10S at a concentration of 0.6 ppb. Dibenzofuran was detected in three groundwater samples collected from across the site at concentrations ranging from 1 ppb to a maximum of 8 ppb in sample MW-101. Carbazole was detected in two of the groundwater samples at concentrations of 1 and 2 ppb. Phenol was detected in two groundwater samples at 2 and 5 ppb.

4.2.3 Pesticides/PCBs

This section presents a discussion of the nature and extent of pesticide and PCB contamination detected in OFFTA groundwater.

During the various OFFTA site investigations, 22 groundwater samples were collected for pesticides/PCBs analysis.

Only one pesticide was detected in site groundwater. The pesticide compound endrin was detected in the bedrock well MW-8R at an estimated ("J" qualifier) concentration of 0.05 ppb. RIDEM does not provide GB Groundwater Objectives for pesticides. The groundwater results also indicated that no detectable PCB compounds were present in the site groundwater.

4.2.4 Metals

This section presents a discussion of the nature and extent of metals contamination detected in OFFTA groundwater.

During the various OFFTA site investigations, 29 unfiltered groundwater samples were collected and analyzed for total metals.

Numerous metals were detected in the groundwater samples collected at the site. The metals most common to the groundwater samples collected on the site include aluminum, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, potassium, sodium, and zinc. Metals detected less frequently in the groundwater samples include antimony (2 samples), arsenic (14 samples), beryllium (9 samples), cadmium (12 samples), mercury (10 samples), nickel (9 samples), silver (9 samples), and vanadium (13 samples). Cyanide was detected in the one sample that was analyzed for it. The highest concentrations of inorganic groundwater contamination were detected in monitoring wells MW-2S and MW-3S, located in the northern and central portion of the site, respectively. These wells were sampled using bailers. A summary of the concentration ranges for the metals detected in the unfiltered groundwater samples is provided in Table 4-3.

During the various OFFTA site investigations, 8 filtered groundwater samples were collected and analyzed for dissolved metals.

The same metals were detected in the filtered groundwater samples collected at the site as were detected in unfiltered samples. However, the frequency and magnitude of detections were decreased in the filtered samples. Th metals most common to the filtered groundwater samples collected on the site include barium, calcium, iron, magnesium, manganese, potassium, and sodium. A summary of the concentration ranges for the metals detected in the filtered groundwater samples is provided in Table 4-3.

A comparison of the filtered versus non-filtered sample results indicates that generally the inorganic concentrations in the filtered samples are far below the concentration of the non-filtered samples. The only metals that did not have significantly different concentrations between the filtered and non-filtered samples are calcium, potassium, magnesium, manganese, and sodium, indicating that these elements are primarily present in a dissolved form. Antimony was detected at a higher concentration in filtered groundwater than in unfiltered groundwater.

It appears from the filtered data that the high concentrations of inorganic contamination detected in the site groundwater may be due to the high amount of silt that was observed in the groundwater sampled from many of the wells during the sampling. This finding is further substantiated by comparing the inorganic results with the turbidity values measured at the time of the sampling. This comparison indicates that those groundwater samples that had the lower turbidity values typically had the lower concentrations of metals. Although filtered or dissolved metals groundwater analysis is not typically accepted for comparison to groundwater standards, this data along with the associated turbidity information should be considered when evaluating the site groundwater data.

To evaluate the inorganic analyte groundwater data, the inorganic analyte levels detected in the groundwater samples were compared with site-specific, off-site upgradient groundwater sample data. Other applicable criteria for comparison are unavailable. RIDEM does not provide GB Groundwater Objectives for inorganics. A summary of the site-specific upgradient groundwater sample inorganic compound results, both unfiltered and filtered) is provided in Table 4-3. An overall comparison of the inorganic analyte concentration ranges detected in the site groundwater samples to the upgradient levels is provided in Table 4-3.

An evaluation of the metals groundwater data indicates that some concentrations of all metals were detected in unfiltered groundwater samples at concentrations greater than unfiltered upgradient groundwater concentrations. Calcium, magnesium, potassium, and sodium were the metals detected most frequently at concentrations greater than upgradient concentrations.

For several of the metals detected in filtered groundwater samples, some samples exceeded concentrations in upgradient filtered groundwater samples. Calcium, iron, magnesium, potassium, and sodium were the metals detected most frequently at concentrations greater than upgradient concentrations.

4.2.5 Total Petroleum Hydrocarb ns

This section presents a discussion of the nature and extent of TPH contamination detected in OFFTA groundwater.

During the various OFFTA site investigations, 13 groundwater samples were collected for TPH analysis.

The analytical results for TPH were below the detection limit for all 13 groundwater samples. These results, in conjunction with the SVOCs analyses for soils and groundwater, indicate that while petroleum hydrocarbons are present in subsurface soils, little or none are partitioning or migrating into groundwater.

4.3 STORM WATER SEWER ASSESSMENT

The objective of the storm sewer outfall investigation was to determine if site contaminants were discharging from the storm sewers. Storm water sewer samples were collected initially during the Phase II RI to address observations of an oily sheen reportedly seen flowing from an outfall pipe into Narragansett Bay at the northern portion of the site. The sampling included the collection of storm water samples from a catch basin along Taylor Drive (sample ST-1), upgradient of the site, and from the outfall pipe flowing into Narragansett Bay (sample ST-2).

During the Source Removal Evaluation, two storm sewer samples (plus one field duplicate) were collected from a storm drain system that is in-line with the outfall on the northern shoreline (SW-1 and SW-2). Storm sewer sample SW-2 was collected from a manhole on the western side of the central mound.

The four storm sewer samples were analyzed for the full TCL/TAL. Two storm sewer samples were analyzed for cyanide. Two storm sewer samples were analyzed for TPH. A summary table detailing the frequency of detection; maximum and minimum detected concentrations; average concentrations; and comparisons to USEPA Ambient Water Quality Criteria (AWQC) for marine waters is presented on Table 4-4. The storm sample locations are shown on Figure 4-4.

The storm water assessment discussion is presented in order of the following chemical compound classes: VOCs, SVOCs, pesticides/PCBs, and metals. Storm water contaminant levels were compared to the USEPA Ambient Water Quality Criteria (AWQC) for marine waters. Contaminant-specific comparisons of detected levels to AWQCs are presented in Table 4-4.

4.3.1 Volatile Organic C mp unds (VOCs)

Results of the storm sewer water sample analysis indicated that no VOCs were present in any of the four samples. While detectable concentrations of VOCs were not present in the four samples, a petroleum sheen was observed in the catch basin at the location of sample ST-1. A strong petroleum-like odor was also observed in the catch basin at the time of sample collection. It is likely that the petroleum odors and sheen represent an aged or degraded petroleum source and the TCL VOC analysis was not successful in identifying the contaminants.

4.3.2 Semivolatile Organic Compounds (SVOCs)

Semivolatile organic compounds detected in the storm water samples include PAHs, phenol, and bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate was detected in two samples at a concentration of 3 ppb and in two samples at a concentration of 2 ppb. Phenol was detected in SW-2 only at 2 ppb. PAHs were only detected in storm water sample ST-2. PAHs detected in the sample include acenaphthene, anthracene, fluorene, 2-methylnaphthalene, phenanthrene, and pyrene. The concentrations of these compounds ranged from 1 to 3 ppb for a total PAH concentration of 10 ppb.

4.3.3 Pesticides/PCBs

Results of the Phase II RI storm water sampling at the site indicate that pesticide compounds were present in two samples. The pesticides dieldrin and eldrin were detected in storm water samples ST-1 and ST-2, while endosulfan II, endosulfan sulfate, and 4,4-DDT were only detected in sample ST-2. These pesticide compounds were detected at low concentrations ranging from 0.0058 ppb to 0.051 ppb. For each of the pesticide compounds detected, with the exception of endosulfan sulfate, the concentrations detected exceeded the marine chronic water quality criteria. However, only endrin was detected at a concentration exceeding the marine acute criteria in sample ST-2.

4.3.4 Metals

Results of the storm water sampling, inorganic analysis, indicated that low concentrations of several m tals were present in water samples. Metals detected in all four samples include aluminum, barium, calcium, iron, lead, magnesium, manganese, potassium, sodium, and zinc. Copper was detected in three of the four samples. Arsenic, chromium, and vanadium were detected in two of the four samples.

Of the inorganics detected in the storm water samples copper, lead, zinc, and nickel were detected at concentrations exceeding marine chronic AWQCs. Copper was detected in samples at concentrations ranging from 7.1 ppb to 21.3 ppb. Copper exceeded the marine chronic AWQC of 4.8 ppb in all three samples where it was detected. Lead exceeded the marine chronic AWQC of 8.1 ppb in two samples. Zinc exceeded the marine chronic AWQC of 81 ppb in 2 samples. Nickel exceeded the marine chronic AWQC of 8.2 ppb in sample ST-1 at a concentration of 14.9 ppb.

Only copper and zinc were detected at concentrations exceeding the marine acute AWQCs. The marine acute AWQC for copper is 2.9 ppb. The marine acute AWQC for zinc is 90 ppb.

4.4 SHORELINE SEDIMENT ASSESSMENT

The five shoreline sediments samples discussed in this section were collected during the Phase III investigation, conducted by TtNUS in November 1998. The shoreline sediments sample locations are shown on Figure 4-1.

Sediment samples were collected from 5 locations (SSD-333 – SSD-337) approximately midway between mean low water and mean high water along the shoreline. The samples were all collected from the 0 to 0.5 foot depth interval and analyzed for TCL VOCs, TCL SVOCs, and TCL metals. All samples were collected by hand using stainless steel sampling equipment.

Shoreline sediment contaminant concentrations were compared to the Residential Direct Exposure Criteria established in the RIDEM Remediation Regulations. A summary table detailing the frequency of detection; maximum and minimum detected concentrations; average concentrations; and comparisons to RIDEM Residential Direct Exposure for shoreline sediments is presented on Table 4-5.

4.4.1 <u>Volatile Organic Compounds (VOCs)</u>

This section presents a discussion of the nature and extent of VOC contamination detected in OFFTA shoreline sediments.

Of the 34 VOCs analyzed for presence in shoreline sediment, 7 were detected. Those VOCs detected include methylene chloride, acetone, benzene, bromomethane, 2-butanone, carbon disulfide, and chloromethane. The VOCs were detected in shoreline sediment at low concentrations: the maximum detected concentrations were all less than 50 ug/kg.

Several of the detected VOCs are common laboratory solvents, including methylene chloride, acetone, and 2-butanone. Carbon disulfide is also a solvent. The maximum concentrations of each of these solvents were detected at SSD-333. Acetone was detected in 2 samples at concentrations ranging from 30 ppb to 42 ppb. 2-butanone was detected in 3 samples at concentrations ranging from 5 ppb to 8 ppb. Methylene chlorid was detected in all 5 samples at concentrations ranging from 2 ppb to 4 ppb. Carbon disulfide was det cted in 2 samples at concentrations ranging from 2 ppb to 27 ppb. Benzene, bromomethane, and chloromethane were each detected just once in sample SSD-336.

All detected VOC concentrations were below RIDEM Residential Direct Exposure Criteria for soils.

4.4.2 Semivolatile Organic Compounds (SVOCs)

This section presents a discussion of the nature and extent of SVOC contamination detected in OFFTA shoreline sediment.

The results of the SVOC shoreline sediment analysis indicate that SVOCs are present at all sampling points. The 13 SVOCs detected in the shoreline sediment samples are all PAHs, a subset of SVOCs. PAH compounds were present in the five shoreline sediment samples at concentrations ranging from 230 ppb to 4,400 ppb. CaPAH concentrations detected at these locations ranged from 290 ppb to 1,900 ppb. A map showing the benzo(a)pyrene shoreline sediment sample results is presented as Figure 4-1. The highest concentrations of these and other CaPAHs were detected in samples SSD-334 and SSD-335. The higher total SVOC concentrations (exceeding 10,000 ug/kg) were detected at the three locations off the central portion of the site (SSD-333, SSD-334, and SSD-335). The sample from SSD-337, the eastern-most sediment sample location had the lowest total SVOC concentrations (less than 1000 ug/kg).

Concentrations of detected CaPAHs, including benzo(a)antracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and indeno(1,2,3-cd)pyrene were greater than RIDEM Residential Direct Exposure Criteria for soils (Table 4-5).

4.4.3 Metals

This section presents a discussion of the nature and extent of metals contamination detected in OFFTA shoreline sediment.

Nineteen metals were detected in the shoreline sediment samples collected at the site. The metals common to all the shoreline sediment samples collected on the site include aluminum, arsenic, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, and zinc. Metals detected less frequently in the shoreline sediment samples include antimony (2 samples), barium (4 samples), beryllium (1 sample), and silver (4 samples). Cadmium, mercury, selenium, and thallium were not detected in any of the shoreline sediment samples. A summary of the concentration ranges for the metals detected in the shoreline sediment samples is provided in Table 4-5. The metals concentrations were generally comparable with or lower than those detected in surface soils. A few compounds (calcium, sodium, and vanadium) were consistently higher in the sediment. The metals concentrations did not vary significantly among sediment samples. The concentrations for individual metals were generally in the same order of magnitude at all five sample locations.

Detected concentrations of metals were compared to RIDEM Residential Direct Exposure Criteria for soils. Detected concentrations of arsenic, beryllium, lead, and manganese exceeded their respective RIDEM Residential Direct Exposure Criteria for soils. Arsenic concentrations exceeded the RIDEM criteria in all five of the samples analyzed. Beryllium and lead concentrations exceeded the RIDEM criteria in one sample ach. Manganese concentrations exceeded the RIDEM criteria in two samples. A map showing the arsenic shoreline sediment sample results is presented as Figure 4-1.

4.5 MARINE SEDIMENT ASSESSMENT

Twenty-three sampling stations, located in Coasters Harbor, both immediately adjacent to and in the wider area surrounding the site were established for marine sediment and biota sampling as part of the SAIC Marine Ecological Risk Assessment investigation. The locations of the sampling stations were selected to characterize the offshore gradient in contaminant concentrations. Twenty-one stations were located at the north end of Coasters Harbor Island. Two reference stations (OFF-22 and OFF-23) were selected in an area of southeastern Coasters Harbor approximately 1.2 km south of the site. The marine sediment sample locations are shown on Figure 2-15. Sampling stations OFF-1 through OFF-11, OFF-15, and OFF-22 represent intertidal/subtidal sandy stations. Sampling stations OFF-12 through OFF-14, OFF-16 through OFF-21, and OFF-23 represent subtidal less sandy stations. Surface grab samples (0-15 cm) were collected at all 23 sampling stations. Additional samples were taken at depth (to 1 meter) for a subset of sampling stations. A summary table detailing the frequency of detection; maximum and minimum detected concentrations; and average concentrations is presented on Table 4-6.

Standards for contaminants in sediments are not set forth by state or federal government. Contaminants in sediments are evaluated as a part of the ecological risk assessment (SAIC 2000), summarized in Section 7 of this report.

4.5.1 Semivolatile Organic Compounds (SVOCs)

This section presents a discussion of the nature and extent of SVOCs detected in OFFTA marine sediment.

During Phase III OFFTA site investigation, 35 marine sediment samples were collected and submitted for TCL SVOC analysis.

The results of the SVOC marine sediment analysis indicate that SVOCs are present at all sampling points. The SVOCs detected in the marine sediment samples are predominantly PAHs, a subset of SVOCs. PAH compounds were present in the marine sediment samples at concentrations ranging from 0.2 ppb to 25,000 ppb. CaPAH concentrations detected at these locations ranged from 0.8 ppb to 25,000 ppb. The highest concentration of each PAH was detected in sample OFF-5, located in the nearshore area opposite the central portion of the site and the storm drain outfall pipe. Detected CaPAHs included benzo(a)antracene, benzo(a)pyrene, benzo(b,j,k)fluoranthene, benzo(g,h,l)perylene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Detected non-carcinogenic PAHs included acenaphthene, acenaphthylene, anthracene, benzo(e)pyrene, fluoranthene, fluorene, 1-methylphenanthrene, naphthalenes, perylene, phenanthrene, and pyrene.

4.5.2 Pesticides/PCBs

This section presents a discussion of the nature and extent of pesticides and PCBs detected in OFFTA marine sediments.

During the Phase III site investigations, 35 marine sediment samples were collected for pesticides/PCBs analysis.

Pesticides were detected in many of the marine sediment samples collected in the vicinity of the site. In all instances, however, the detected pesticide concentrations were very low (ppt to ppb) concentrations. Given the widespread presence of pesticides in the marine sediment samples, an overall relative evaluation of the pesticide marine sediment data was performed to locate samples having some of the highest individual pesticide concentrations. This review identified a few pesticides as the most frequently detected, including 4,4'-DDD, 4,4'-DDT, and alpha-chlordane. Some of the highest overall pesticides levels were detected in samples OFF-13 and OFF-18, both located off-shore to the east of the site.

PCB congeners were detected in all marine sediment samples, with the highest concentrations at OFF-6, located in the nearshore area just east of the central portion of the site.

4.5.3 Metals

This section presents a discussion of the nature and extent of metals detected in OFFTA marine sediments.

During the Phase III OFFTA site investigation, 35 marine sediment samples were collected and analyzed for metals.

Numerous metals were detected in the marine sediment samples collected in the vicinity of the site. The metals common to all the marine sediment samples collected include aluminum, arsenic, cadmium, chromium, copper, iron, lead, and manganese. Metals detected less frequently in the shoreline sediment samples include nickel (34 samples), mercury (26 samples), silver (18 samples), and zinc (16 samples). Antimony, barium, beryllium, cobalt, magnesium, selenium, thallium, and vanadium were not detected in any of the marine sediment samples. A summary of the concentration ranges for the metals detected in the marine sediment samples is provided in Table 4-6.

The metals aluminum, iron, and manganese are considered primarily derived from the natural breakdown of rock and soil. Arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc are naturally occurring in low background concentrations, but are generally considered to be anthropogenic.

4.6 MARINE ORGANISMS

Natural populations of blue mussels, hard clams, cunner fish, and lobster were collected at a subset of the marine sediment sampling stations during the SAIC Marine Ecological Risk Assessment investigation. Blue mussel (Mytilus edulis) and cunner fish (Tautogolabrus adspersus) were the target species at the intertidal stations (OFF-1 through OFF-7). Hard clams (Mercenaria mercenaria or Pitar morrhauna) and lobster were collected at subtidal stations (OFF-8 through OFF-21). Summary tables detailing the frequency of detection; maximum and minimum detected concentrations; and average concentrations are presented on Tables 4-7A-D.

Standards for some contaminants in biota are set forth by the U.S. Food and Drug Administration (FDA). All detected concentrations of contaminants in biota tested at the site were below FDA action levels, therefore, comparisons are not provided in this report.

4.6.1 Semivolatile Organic Compounds (SVOCs)

This section presents a discussion of the nature and extent of SVOC contamination detected in OFFTA biota sampling.

Clams

During the Phase III OFFTA site investigation, 13 clam tissue samples were collected and submitted for TCL SVOC analysis.

The results of the SVOC clam tissue analysis indicate that SVOCs are present at all sampling points. The SVOCs detected in the clam tissue samples are PAHs, a subset of SVOCs. Total PAH concentrations ranged from 94.6 ppb to 321.8 ppb. The highest concentrations of PAHs were detected in samples collected at station OFF-19, located northwest of the site, and the reference station, OFF-23.

Blue Mussel

During the Phase III OFFTA site investigation, eight blue mussel tissue samples were collected from the site and submitted for TCL SVOC analysis.

The results of the SVOC blue mussel tissue analysis indicate that SVOCs are present at all sampling points. The SVOCs detected in the blue mussel tissue samples are PAHs, a subset of SVOCs. Total PAH concentrations ranged from 258 ppb to 503 ppb. The highest concentrations of PAHs were detected in samples collected at station OFF-7, located nearshore east of the site, and the reference station, OFF-22.

Lobster

During the Phase III OFFTA site investigation, 14 lobster tissue samples were collected and submitted for TCL SVOC analysis.

The results of the SVOC lobster tissue analysis indicate that SVOCs are present at all sampling points. Th SVOCs detected in the lobster tissue samples are PAHs, a subset of SVOCs. Total PAH concentrations ranged from 65 ppb to 1783 ppb. The highest concentrations of PAHs were detected in samples collected at station OFF-21, located in the distant area opposite the central portion of the site.

Cunner fish

During the Phase III OFFTA site investigation, four cunner fish tissue samples were collected and submitted for TCL SVOC analysis.

The results of the SVOC cunner fish tissue analysis indicate that SVOCs are present at all sampling points. The SVOCs detected in the four cunner fish tissue samples are polynuclear aromatic hydrocarbons (PAHs), a subset of SVOCs. Total PAH concentrations ranged from 36.7 ppb to 96.4 ppb. The highest concentrations of PAHs were detected in samples collected at station OFF-4, located in the near shore area off the central portion of the site.

4.6.2 Pesticides/PCBs

This section presents a discussion of the nature and extent of pesticide and PCB contamination detected in OFFTA biota sampling.

Clams

During the Phase III OFFTA site investigation, 13 clam tissue samples were collected for pesticides/PCBs analysis.

Pesticides were detected in many of the clam tissue samples collected at the marine sampling stations. In all instances, however, the detected pesticide concentrations were very low (ppt to ppb) concentrations. An overall relative evaluation of the pesticide clam tissue data was performed to locate samples having some of the highest individual pesticide concentrations. This review identified a few pesticides as the most frequently detected, including 2,4'-DDD, 4,4'-DDE, 2,4'-DDT, alpha-chlordane, dieldrin, and hexachlorobenzene. Some of the highest overall pesticides levels were detected in samples OFF-10 located off-shore from the central portion of the site. In general, the data show little relative difference with reference station OFF-23.

PCB congeners were detected in all clam tissue samples, with the highest concentrations at OFF-10 located off-shore from the central portion of the site.

Blue Mussel

During the Phase III OFFTA site investigation, eight blue mussel tissue samples were collected for pesticides/PCBs analysis.

Pesticides were detected in many of the blue mussel tissue samples collected at the marine sampling stations. In all instances, however, the detected pesticide concentrations were very low (ppt to ppb) concentrations. An overall relative evaluation of the pesticide blue mussel tissue data was performed to locate samples having some of the highest individual pesticide concentrations. This review identified a few pesticides as the most frequently detected, including 2,4'-DDD, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, 2,4'-DDT, alpha-chlordane, dieldrin, endosulfan II, gamma-BHC, and hexachlorobenzene. In general, the data show little relative difference in the concentrations at any of the eight stations.

PCB congeners were detected in all blue mussel tissue samples, with the highest concentrations at OFF-5, located in the nearshore area opposite the central portion of the site.

Lobster

During the Phase III OFFTA site investigation, 14 lobster tissue samples were collected for pesticides/PCBs analysis.

Pesticides were detected in many of the lobster tissue samples collected at the marine sampling stations. In all instances, however, the detected pesticide concentrations were very low (ppt to ppb) concentrations. An overall relative evaluation of the pesticide lobster tissue data was performed to locate samples having some of the highest individual pesticide concentrations. This review identified a few pesticides as the most frequently detected, including 2,4'-DDT, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endosulfan II, gamma-BHC, and hexachlorobenzene. Highest concentrations were detected in samples collected from stations OFF-13 and OFF-21.

PCB congeners were detected in all lobster tissue samples, with the highest concentrations at OFF-21, located in the distant area opposite the central portion of the site.

Cunner fish

During the Phase III OFFTA site investigation, four cunner fish tissue samples were collected for pesticides/PCBs analysis.

Pesticides were detected in each of the cunner fish tissue samples collected at the marine sampling stations. In all instances, however, the detected pesticide concentrations were low concentrations. A few pesticides wer the most frequently detected, including 2,4'-DDD, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, 2,4'-DDT, alpha-chlordane, dieldrin, endosulfan II, gamma-BHC, heptachlor epoxide, and hexachlorobenzene. In general, the data show little relative difference in the concentrations at any of the four stations.

PCB congeners were detected in all cunner fish tissue samples, with the highest concentration (663.8 ppb) at OFF-2, located in the nearshore area at the west end of the site. The fish tissues tend to be higher in PBCs relative to other organisms.

4.6.3 Metals

This section presents a discussion of the nature and extent of metals contamination detected in OFFTA biota sampling.

Clams

During the Phase III OFFTA site investigation, 13 clam tissue samples were collected and analyzed for metals.

Numerous metals were detected in the clam tissue samples collected at the marine sampling stations. The metals common to all the clam tissue samples collected include aluminum, arsenic, cadmium, iron, lead, mercury, nickel, and zinc. Metals detected less frequently in the clam tissue samples include chromium (7 samples) and copper (2 samples). A summary of the concentration ranges for the metals detected in the clam tissue samples is provided in Table 4-7A. In general, the data show little relative difference in concentration and little relative difference with reference station OFF-23. No obvious spatial pattern occurs in the clam data.

Blue Mussel

During the Phase III OFFTA site investigation, eight blue mussel tissue samples were collected and analyzed for metals.

Numerous metals were detected in the blue mussel tissue samples collected at the marine sampling stations. The metals common to all the blue mussel tissue samples collected include arsenic, cadmium, iron, lead, mercury, nickel, and zinc. Metals detected less frequently in the blue mussel tissue samples include aluminum (6 samples), chromium (3 samples), and copper (6 samples). A summary of the concentration ranges for the metals detected in the blue mussel tissue samples is provided in Table 4-7B. In general, the data show little relative difference in concentration at the eight stations with the exception of chromium and aluminum and little relative difference with reference station OFF-22. No obvious spatial pattern occurs in the blue mussel data.

Lobster

During the Phase III OFFTA site investigation, 14 lobster tissue samples were collected and analyzed for metals.

Numerous metals were detected in the lobster tissue samples collected at the marine sampling stations. The metals common to all the lobster tissue samples collected include aluminum, arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, and zinc. A summary of the concentration ranges for the metals detected in the lobster tissue samples is provided in Table 4-7C. In general, most of the data show little relative difference in concentration at the 13 stations and little relative difference with reference station OFF-23. However, silver concentrations are higher at stations OFF-14, OFF-19, and OFF-20 on the western boundary of the study area; mercury, cadmium, and nickel are higher in lobsters from station OFF-13 deep within Coasters Harbor; and mercury and nickel are higher in the lobsters taken from station OFF-14 at the mouth of Coasters Harbor.

Cunner fish

During the Phase III OFFTA site investigation, four cunner fish tissue samples were collected and analyzed for metals.

Numerous metals were detected in the fish tissue samples collected at the marine sampling stations. The metals common to all the fish tissue samples collected include aluminum, arsenic, cadmium, chromium, copper, iron, lead, silver, and zinc. The fish tissues tend to be low in inorganic contaminants relative to other organisms with the exception of higher concentrations of chromium (21.7 to 36.9 ppb) and copper (25.6 to 32.4 ppb). A summary of the concentration ranges for the metals detected in the fish tissue samples is provided in Table 4-7D. In general, the data show little relative difference in concentration.

5.0 CONTAMINANT FATE AND TRANSPORT

Activities associated with the operation and demolition of the Old Fire Fighting Training Area have resulted in the presence of VOCs, SVOCs, pesticides, PCBs, dioxins, furans, and metals in site soils. The occurrence of many of these chemicals in groundwater and adjacent marine sediments suggests they have migrated from the soil to other environmental media. Nevertheless, most of the contaminants detected in the various media are present at very low concentrations. Pesticide, PCB, dioxin, and furan concentrations were generally quite low and always less than pertinent regulatory criteria wherever they were detected (see Section 4.1 of this report). Likewise, several VOCs, SVOCs, and metals were present at very low concentrations in soil, groundwater, and sediment samples, and many were detected in only a few samples.

Some of the most pervasive contaminants at the site were polycyclic aromatic hydrocarbons, or PAHs. These compounds are found in petroleum fuels and their combustion byproducts. Visible petroleum contamination was observed in several test pits and soil borings at depths ranging from four to 16 feet below the ground surface (see Figure 4-3). Although no measurable LNAPL has ever been observed in any of the site's monitoring wells — and most of the wells are screened across the water table — petroleum-stained soils were generally observed in test pits and soil borings at or near the water table. Due to their prevalence and toxicity, the following analysis of contaminant fate and transport focuses on the petroleum-related hydrocarbons as well as arsenic, chromium, and lead.

The transport and ultimate fate of these contaminants are governed by a variety of physical, chemical, and biological processes that are dependent upon the properties of both the contaminants and the media into which the contaminants are released. Section 5.1 briefly describes the processes of potential relevance to the Old Fire Fighting Training Area (OFFTA) site. Sections 5.2, 5.3, and 5.4 present an assessment of VOC, SVOC, and metal fate and transport, and section 5.6 summarizes the results. The evaluations of fate and transport are qualitative; more information would be needed to provide definitive quantitative analyses.

5.1 FATE AND TRANSPORT PROCESSES

Past operating practices at the OFFTA site have resulted in contaminant releases to site soils. Upon release, a variety of processes occur that may cause these chemicals to be destroyed or transferred to other environmental media (groundwater, air, shoreline or marine sediments). Several of these processes are briefly described below, beginning with those which are of primary importance in the unsaturated soil environment.

Leaching – Chemicals may be mobilized and transported downward through the soil strata by rain water, snowmelt, or other liquids that infiltrate through the soils. The leaching of chemicals from soils is controlled by the mineralogy, organic carbon content, and specific surface area of the soils, as well as the chemical character of the contaminant and the infiltrating liquid.

Runoff/Erosion – During rain events, surface soil contaminants may be conveyed over land in the ensuing runoff. The soil contaminants may become entrained in the runoff by dissolution or by runoff-induced detachment of contaminated soil particles. To a much lesser extent, contaminated soil particles may be mobilized by wind-, wave-, or gravity-induced detachment and transport.

Volatilization – Chemicals having high Henry's Law coefficients or vapor pressures will tend to partition (volatilize) to the ambient air rather than remain associated with soil liquid or solid phases. Once in the air, the chemicals may undergo physical transport by advection or diffusion, or they may be transformed through chemical processes such as hydrolysis or photolysis. Volatile organic compounds include chlorinated aliphatic and aromatic hydrocarbons. The partitioning of these compounds depends not only on volatility and solubility, but on temperature, soil moisture content, and the presence of organic matter.

Non-Aqueous Phase Liquid (NAPL) Migration – Organic liquids such as jet fuel and gasoline have densities less than water and are referred to as LNAPLs (light nonaqueous phase liquids). Chlorinated solvents have densities greater than water and are examples of DNAPLs (dense nonaqueous phase liquids). The transport of NAPLs in subsurface environments is a complex process that is strongly influenced by the geology of the system. When a NAPL is spilled on the ground surface or released beneath it, the NAPL will migrate downward through the unsaturated zone toward the water table, primarily by gravity-driven flow. The presence of low permeability layers will inhibit downward migration and force the NAPL to move laterally. If the layer is continuous, downward movement may cease. If the layer is discontinuous, the NAPL will eventually spill over its edge and continue to migrate downward toward the water table.

As the NAPL moves downward, the quantity of mobile free product decreases and the quantity trapped within soil pores increases. Depending on the volume of NAPL released, it may or may not reach the water table. If the NAPL reaches the water table and its density is less than water, it will remain in pockets at the top of the water column. If the density of the NAPL is greater than water, it will continue to move downward through the water column under the influence of gravity, migrating laterally along the top of any low permeability units it encounters along the way. Once again, downward migration may cease if the low permeability stratum is continuous; otherwise, its downward migration will resume when it encounters the end of the stratum or near vertical preferential flow paths within the stratum. The direction of DNAPL transport in aquifers is driven primarily by gravity and the occurrence of relatively high and low permeability features; as a result, the direction of DNAPL transport may or may not coincide with the direction of groundwater flow. DNAPL zones in aquifers may be located upgradient or downgradient from their point of release, and in stratified media they likely consist of multiple subhorizontal pools that are resting on top of low conductivity layers. The subhorizontal pools are typically connected to one another and to a pool at the base of the aquifer by vertical DNAPL stringers.

As water moves through NAPL pools above or below the water table, the more soluble constituents partition into the water to generate a plume of dissolved contamination and the more volatile contaminants partition to the vapor phase. Depending on the local hydrogeology and the composition of the NAPL, the rate of dissolution may be so slow that the NAPL causes significant groundwater contamination for centuries or more.

Advection - The dominant transport process in aquifers consists of the movement of dissolved or suspended phase contaminants with the bulk flow of the water. Advective transport results from the entrainment of chemicals in a flow field, and it is driven by a potential gradient, such as pressure or hydraulic head. The direction and rate of advective transport coincide with the direction and rate of groundwater flow.

Dispersion – Dispersion is a mixing process that results from velocity variations within bodies of moving fluids. In groundwater environments variable velocity regimes are caused by nonidealities in the media, and these nonidealities exist at a variety of scales. For example, velocity variations at the microscopic scale arise from: 1) fluids moving faster through the centers of pores than along the edges, 2) fluids moving faster through large pore spaces than through narrow ones, and 3) some fluid particles following more tortuous flow paths than others as they travel around individual soil particles. At the macroscopic scale, velocity variations result from the presence of layers or lenses of materials having contrasting hydraulic conductivities.

The mixing due to dispersion increases as aquifer heterogeneity increases, and it results in dilution of the solute body as contaminated water mixes with uncontaminated water along the margins of the plume. Dispersion also results in the spreading of a contaminant plume over a larger area (both parallel and perpendicular to the direction of flow) than would be expected by advection alone.

Molecular Diffusion – Diffusion is movement in response to a concentration gradient. Dissolved contaminants will move from areas of high concentration to areas of low concentration within an aquifer even if the groundwater is not moving, because the process is driven by the random thermal motion of the contaminant molecules. Diffusive transport is a slow process; therefore, its impact is usually small compared to the more rapid processes of advection and dispersion. Diffusion is the dominant transport mechanism only in low-permeability hydrogeologic systems

Retardation – Most groundwater contaminants react to some extent with the aquifer's solid surfaces. As a result, their transport is affected not only by the processes of advection, dispersion, and diffusion, but also by surface reactions. If the contaminants participate in adsorption/desorption reactions with mineral surfaces or the oxyhydroxide or organic coatings on these surfaces, the rate of contaminant transport will be slower than the rate of groundwater flow. The extent to which the movement of a plume is retarded relative to the rate of groundwater flow depends on the solute's propensity to sorb to the aquifer's surfaces. The propensity to sorb is governed by many factors including: the chemical character of the solute, the composition of the aquifer's solid surfaces, and the ground water chemistry.

Single parameter distribution coefficients (K_ds) are often used to quantify the tendency for a solute to sorb to media surfaces. These distribution coefficients are based on a linear model of adsorption — i.e. it is assumed the mass of solute sorbed increases in a linear fashion as the dissolved concentration of the solute increases. Research has demonstrated that this assumption is reasonable for nonionic organic solutes; however, ionic solutes tend to display nonlinear adsorption behavior at high concentrations because the number of charged adsorption sites on a surface is limited. Therefore, single parameter distribution coefficients often do a poor job of describing the adsorption of ionic solutes in all but dilute solutions.

Nonionic organic solutes such as BTEX compounds and PAHs sorb primarily to organic coatings on mineral surfaces. A number of studies have shown that nonionic organic solute K_ds can be estimated from the fraction of organic carbon in the soil and the octanol-water partition coefficient (K_{ow}) of the solute. As a result, the octanol water partition coefficient can be used as an index for evaluating the relative tendencies for different organic solutes to sorb to the same surface.

Degradation – Organic contaminants may be degraded by biological or nonbiological means. Degradation decreases the concentration of a solute in a plume, but it does not necessarily slow the rate of plume movement. Although some compounds degrade relatively quickly via abiotic pathways, biodegradation is typically the more important destructive mechanism. In biodegradation, microorganisms oxidize or reduce contaminants in their quest to obtain energy and nutrients. Depending on the microorganisms and contaminants present, biodegradation can occur under aerobic or anaerobic conditions.

Biodegradation is accomplished by microbially-mediated electron transfer reactions. In these reactions contaminants may be used as electron donors (a source of energy) or electron acceptors, or they may be fortuitously degraded by an enzyme or cofactor produced during the oxidation of other organic carbon sources (a process referred to as cometabolism). Fuel hydrocarbons are biodegraded through use as an electron donor. The oxidation of fuel hydrocarbons is mainly limited by the availability of electron acceptors, and it generally proceeds until all of the contaminant is destroyed. In aerobic systems the BTEX, PAH, and phenolic components of fuels are degraded relatively quickly by microorganisms that use oxygen as an electron acceptor. In the absence of oxygen the degradation of most fuel hydrocarbons can continue, but usually at much slower rates. Under anaerobic conditions microorganisms reduce other, less energetically favorable electron acceptors such as nitrate, ferric iron, and sulfate as they oxidize fuel hydrocarbons to obtain energy needed for growth.

5.2 FATE AND TRANSPORT OF SELECTED VOCs

When a petroleum-based fuel is spilled on the ground surface or released beneath it, the organic liquid will percolate downward toward the water table. If a sufficient volume of NAPL is released, it will reach the water table and directly contaminate the groundwater. The residual NAPL, trapped within the pore spaces of the soil above the water table, serves as an important source of secondary contamination. Components of the residual NAPL can partition into the vapor phase and/or dissolve into infiltrating water. The degree of partitioning depends upon the relative volatility and solubility of the constituents in the NAPL. The more volatile, water soluble, and therefore mobile components of petroleum-related NAPLs are the BTEX compounds (Table 5-1).

These four VOCs were not detected in most of the soil, groundwater, and sediment samples collected during the various phases of investigation at the OFFTA site. Traces (≤ 4μg/kg) of toluene and xylene were detected in a few surface soil samples. Concentrations were higher in subsurface soils, but did not exceed 67μg/kg toluene and 1200μg/kg xylene. Ethylbenzene was found in only three subsurface soil samples (max. = 630μg/kg) and one groundwater sample (38μg/L), and low concentrations of benzene were found in two groundwater samples (max. = 33μg/L) and one shoreline sediment sample (max. = 1μg/kg).

The scarcity and low concentrations of BTEX compounds in the soils, groundwater, and sediments of this petroleum-affected system indicate the bulk of the soluble and volatile petroleum hydrocarbons have already been removed. Apparently, nearly all of the BTEX mass in the NAPL source has partitioned to the vapor phase or dissolved phase and has been degraded or transported out of the system, leaving behind a relatively insoluble and recalcitrant petroleum residue.

5.3 FATE AND TRANSPORT OF SELECTED SVOCs

Petroleum-related PAHs are much less volatile and soluble than BTEX compounds; as a result, these contaminants were still present at high concentrations in many of the soil samples collected during the various phases of investigation at the OFFTA site. Measures of total PAH concentrations in subsurface soil samples were as high as 21,100μg/kg. By contrast, measures of total PAH concentrations in groundwater samples did not exceed 137μg/L, and individual PAHs were detected in only 10 of the 27 samples. The low concentrations found in groundwater are likely due to the low solubilities of these compounds and their strong affinities to sorb to soil particles (see Table 5-1). The PAHs associated with the OFFTA soils will continue to leach into the groundwater, but the solubility and adsorptive characteristics of these contaminants should act to keep groundwater PAH concentrations relatively low.

Groundwater flowing beneath the OFFTA site ultimately moves through the nearshore sediments and discharges to Coasters Harbor and Narragansett Bay. Elevated levels of organic carbon in the marine sediments will enhance the adsorption of dissolved PAHs in groundwater; however, measured PAH concentrations in nearshore sediments are much higher than would be expected from groundwater discharge alone. The PAHs associated with OFFTA shoreline and marine sediments are probably derived not only from groundwater, but also from direct contact with site-related fuels and combustion byproducts, wind and water erosion of PAH-coated soil particles, weathering of asphalt fragments present in the intertidal zone, outflow from a storm sewer pipe that drains a parking lot on the southern edge of the site, and other off-site sources such as fuel leaks and spills from boating activities in the harbor and bay.

5.4 FATE AND TRANSPORT OF SELECTED METALS

With one exception, arsenic, chromium, and lead were detected in every surface and subsurface soil sample collected at the OFFTA site. Furthermore, concentrations of each of these toxic metals exceeded background concentrations in one or more soil samples. The arsenic, chromium, and lead adsorbed to the OFFTA soil particles can be mobilized through wind-, water-, or gravity-induced erosion, or through leaching to groundwater. In subsurface soil and groundwater environments, the mobility of these metals is primarily a function of the types of complexes formed in solution, the affinity of the solid phase for the contaminants, and the solubilities of minerals containing the contaminants.

Arsenic – Arsenic can occur in the +5, +3, +1, 0, and –3 valence states. However, under oxidizing to mildly reducing conditions in the pH range of 4 to 9, the dominant species is As(V). Dissolved arsenic concentrations in oxidizing environments are usually not controlled by arsenic mineral solubility. Instead, the mobility of As(V) is controlled by adsorption onto iron, manganese, and aluminum oxyhydroxide surfaces. Iron, manganese, and aluminum oxyhydroxides are common mineral weathering products that occur as colloids, soil particles, and mineral coatings in aquifers. If the adsorption capacity of these oxyhydroxide surfaces is not surpassed, arsenic movement will be strongly retarded by the high affinity of these surfaces for As(V). The affinity for As(V) increases as the pH of the system decreases.

Under more reducing conditions As(III) is the dominant species. Although ferric oxyhydroxides are stable over a wide range of pH and Eh, and they limit the mobility of both arsenic species, As(III) sorbs less strongly to metal oxyhydroxides than does As(V), so it is more mobile. If the redox potential is low enough, oxyhydroxides may no longer be stable and As(III) mobility may be even greater. However, if hydrogen sulfide is present in a strong reducing environment, the precipitation of arsenic sulfides will limit dissolved arsenic concentrations. Arsenic mobility is greatest when the system is mildly reducing and hydrogen sulfide is absent. Under these conditions iron would be in the soluble Fe(II) form, arsenic would be in the mobile As(III) form, and arsenic mineral solubility would not limit the concentrations of dissolved arsenic in solution.

Several OFFTA soil samples exceeded background arsenic concentrations; however, the maximum arsenic concentrations detected in surface and subsurface soils (10.4mg/kg and 74.4mg/kg, respectively) were similar to their respective background values (5.5mg/kg and 42.8mg/kg). Likewise, the maximum arsenic concentration detected in filtered groundwater (28.3µg/L) was approximately the same as the unfiltered background value (16.5µg/L), and with three exceptions the concentrations in unfiltered groundwater samples were within an order of magnitude of this background value. The three anomalous unfiltered samples, collected from MW-1, MW-2, and MW-4 in 1990, had arsenic concentrations ranging from 2200µg/L to 16,600µg/L. Subsequent samples collected from these wells had arsenic concentrations that were consistent with those found in samples collected from the other wells on the site. Apparently, the three unfiltered samples in 1990 were fairly turbid and contained a substantial load of suspended arsenic-rich particles.

Since onsite arsenic concentrations were comparable to those detected in background samples, all of the arsenic present in the site's soil and groundwater may be naturally occurring. The slightly higher than background concentrations of arsenic in groundwater are probably due to reducing conditions enhancing the mobility of arsenic. Groundwater pH and dissolved oxygen concentrations were monitored during low flow sampling in 1997. In nearly all of the sampled monitoring wells, solution pH ranged from 6.5 to 7.5, and dissolved oxygen readings were less than 1.0mg/L. These measurements indicate the groundwater generally has a near neutral pH and a fairly low redox potential. It is not clear whether the redox potential is low enough to reduce arsenic to the +3 state, but even if arsenic is in the +5 state it will be relatively mobile because it sorbs less strongly to oxyhydroxides in nonacidic environments.

Arsenic concentrations in the shoreline and marine sediments tended to be slightly less than those found in the site's soils. Nearly all of the arsenic present in these sediments may be naturally occurring.

Chromium – Chromium occurs in the +3 and +6 valence states. In general, Cr(VI) is soluble and mobile and Cr(III) is insoluble and immobile. Cr(III) is the dominant species under reducing and mildly oxidizing conditions when the pH is between 4 and 9. Over this range of pH values, Cr(VI) predominates only under strong oxidizing conditions.

Cr(VI) minerals are relatively soluble; therefore, dissolved concentrations of Cr(VI) are limited primarily by adsorption reactions with clay mineral and oxyhydroxide surfaces. Cr(VI) is relatively mobile in most environments because it is not strongly adsorbed to these surfaces. However, under slightly oxidizing to reducing conditions Cr(VI) will be reduced to Cr(III) which will precipitate as the insoluble mineral $Cr(OH)_3$. The rate of reduction depends on the pH and the availablility of reductants such as organic matter, Fe(II), and sulfide. If the oxidizing capacity of the chromium exceeds the reducing capacity of the aquifer, Cr(VI) will remain relatively stable and mobile. Mn(III) and Mn(IV) minerals may also enhance the stability of Cr(VI) in the environment by oxidizing Cr(III) to Cr(VI).

The stable redox state of chromium under most environmental conditions is Cr(III). Dissolved concentrations of Cr(III) are primarily controlled by the precipitation of $Cr(OH)_3$. $Cr(OH)_3$ is highly insoluble, so there is usually very little dissolved Cr(III) in natural waters. Nevertheless, dissolved Cr(III) concentrations can exceed those predicted by solubility alone, because Cr(III) species can form soluble complexes with water soluble organic matter.

Like arsenic, chromium concentrations in the OFFTA soils were slightly higher, but comparable to concentrations found in background samples. Furthermore, groundwater chromium concentrations were similar to background values with the exception of the same three presumably turbid samples that contained unusually high levels of arsenic and other metals. Due to the presence of organic carbon in the soil zone and reducing conditions in the groundwater environment, most of the chromium in the OFFTA soils and groundwater is probably present in the insoluble Cr(III) form. The presence of up to 89µg/L chromium in filtered groundwater samples at near neutral pH suggests that either some of the chromium is present in the Cr(VI) form, or the mobility of Cr(III) is being enhanced by the formation of soluble low molecular weight organo-chromium complexes that are capable of passing through a 0.45 filter.

Shoreline sediment samples contained slightly less chromium than soil samples, while chromium concentrations in marine sediments were much higher than those in soils. Since the soils, groundwater, and shoreline sediments had much lower concentrations of chromium, off-site sources are probably a major contributor to the chromium levels observed in marine sediments.

Lead – Compared to arsenic and chromium the behavior of lead in natural waters is relatively simple. Lead only occurs in the +2 valence state, and it is one of the least mobile metal contaminants. The mobility of Pb^{2+} is limited in most soil and groundwater systems because: 1) several insoluble lead minerals can control its solubility over a broad range of pH and solution compositions, and 2) Pb^{2+} has a strong affinity for clay, organic matter, and oxyhydroxide surfaces. Since Pb^{2+} is a cation, adsorption increases with pH as the surface sites on organic matter, oxyhydroxide, and pH-dependent clay minerals become more negatively charged. The mobility of lead is greater in low pH environments because most lead minerals are more soluble under acidic conditions, and the net charges on pH-dependent surfaces are positive. Although lead is relatively immobile under most environmental conditions, it can be mobile in any system if the amount entering the environment exceeds the immobilization capacity of the system.

Lead concentrations in OFFTA surface and subsurface soil samples were much higher than those in background samples, indicating the presence of lead contamination at the site. Elevated levels of lead were detected in several unfiltered groundwater samples; however, lead was only detected in one filtered sample, and the concentration in this sample was relatively low (18.3µg/L). These observations suggest the lead in the soils is relatively immobile, only traces of lead are dissolved in groundwater, and the lead in the unfiltered samples is associated with colloidal particles.

Lead concentrations in both the shoreline and marine sediments are much lower than those in soils, but they are still well above soil background levels. Potential sources of sediment contamination include: wind and water erosion of lead-rich soil particles, outflow from the storm sewer pipe that drains the parking lot on the southern edge of the OFFTA site, and other off-site sources such as offshore leaded gasoline spills and leaks, and the deposition of leaded gasoline combustion products.

5.5 SUMMARY

Spills and leaks of petroleum-based fuels and deposition of fuel combustion byproducts have introduced a wide range of petroleum hydrocarbons into the OFFTA site soils. Over the many years since fire fighting training activities have ceased, most of the volatile and soluble petroleum hydrocarbons have apparently partitioned to the vapor phase or dissolved phase and have been degraded or transported off-site, leaving behind a relatively insoluble and recalcitrant petroleum residue. The much less soluble and volatile polycyclic aromatic hydrocarbons (PAHs) are still present at high concentrations in the soils in the central portion of the site. These contaminants will continue to leach into the groundwater, but the solubility and adsorptive properties of these contaminants should keep groundwater PAH concentrations low. The PAHs in nearshore marine sediments likely originated from off-site as well as onsite sources.

Most of the arsenic and chromium in the OFFTA soils and groundwater may be naturally occurring. The near neutral pH and low dissolved oxygen content of the groundwater enhance the mobility of arsenic. By contrast, the presence of organic carbon in the soil zone and reducing conditions in the aquifer reduce the mobility of chromium in both environments. Off-site sources are probably a major contributor to the high chromium concentrations observed in marine sediments.

Lead concentrations in soil samples were often much higher than those in background samples, indicating the presence of lead contamination in the site soils. The lead appears to be immobilized by mineral solubility constraints and adsorption to soil organic matter, clay minerals, and metal oxyhydroxides. The lead in the marine sediments probably originated from both onsite and off-site sources.

6.0 BASELINE HUMAN HEALTH RISK ASSESSMENT

This section provides a description of the risk assessment methods employed for OFFTA Site, as well as a summary of the risk assessment results. The general objectives of the risk assessment were to estimate the actual or potential risks to human health resulting from the presence of contamination in surface soil, subsurface soil, sediment, and fish and to provide the basis for determining appropriate remedial measures (if applicable) for these media as part of a feasibility study. Sections 6.1 through 6.10 discuss the baseline human health risk assessment (BLRA).

6.1 INTRODUCTION

The specific objectives of the BLRA were as follows:

- To estimate the actual or potential risks to human health resulting from the presence of contamination in surface soil, subsurface soil, sediment, and fish.
- To provide a basis for attainment of concentrations that are protective of potential human receptors under residential, recreational, subsistence fishing, and construction exposure scenarios.
- To determine the need for remedial measures (if applicable) for these media.

Three major aspects of chemical contamination must be considered when assessing public health risks: (1) contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist either at the source or via migration pathways if exposure occurs at a remote location other than the source; and (3) human or environmental receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure; without any one of the three factors listed above, there is no risk.

The BLRA for OFFTA Site was divided into Data Evaluation, Exposure Assessment, Toxicity Assessment, Risk Characterization, Uncertainty Analysis, and Summary/Conclusions. Each section is briefly discussed below.

<u>Data Evaluation (Section 6.2)</u> is primarily concerned with data quality assessment, identification of chemicals of potential concern (COPCs), distributional analysis of the data, and calculation of exposure point concentrations. The media/area-specific data are analyzed and COPCs are selected that are representative of the type expected for potential human health exposure. Distributional analysis of the

data is the basis for calculating an exposure point concentration, which provides the chemical input into each of the exposure pathways.

Exposure Assessment (Section 6.3) identifies potential human health exposure, including a characterization of the site setting, selection of potential receptors, selection of exposure routes by medium, a presentation of a site-conceptual model, derivation of exposure estimates for each pathway, and a special explanation of the blood-lead modeling. This section identifies potential pathways of COPC migration, selected potential receptors, and the estimated intakes of COPCs for the identified receptors.

Toxicity Assessment (Section 6.4) presents available reference doses, cancer slope factors, EPA weight of evidence, adjustment of the dose-response parameters, relative potencies for polycyclic aromatic hydrocarbons (PAHs), and toxicity criteria for chromium and methyl mercury. Quantitative toxicity indices, where available, are presented in this section, including any applicable regulatory standards and criteria.

Risk Characterization (Section 6.5) presents the approaches for determining carcinogenic risks, noncarcinogenic risks, and lead risks. The risk characterization evaluates the potential for adverse health effects from exposure to COPC concentrations in environmental media by integrating information developed during the toxicity and exposure assessments.

Uncertainty Analysis (Section 6.6) is a discussion of the general and site-specific uncertainties associated with the BLRA.

Summary (Section 6.7) presents major conclusions of the BLRA.

6.2 DATA EVALUATION

This section presents the approaches for data quality assessment, identification of COPCs, distributional analysis of the data, and exposure point concentrations. Four environmental media were evaluated: surface soil, subsurface soil, sediment, and shellfish. A detailed explanation of the media of concern and how they relate to potential receptor exposure is presented on the Risk Assessment Guidance - Part D (RAGs D) Table 1's, which are presented in Section 6.3.2 and Section 6.3.3. The media of concern selected for the site were as follows:

Media of Concern for OFFTA Site BLRA:

- Surface Soil - Represented by Surface Soil (0 to 1 foot) samples near impacted areas.
- Subsurface Soil* (Represents soil between 2 feet and 10 feet depth near impacted areas)

- Shoreline Sediment
- Lobster
- Clams
- Mussels

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*For this BLRA, subsurface soil was considered as an exposure medium for future potential receptors instead of assuming exposure to a combination of surface soil and subsurface soil (total soil exposure). The reason that soil media were not combined was because a statistical background study of soils revealed that surface and subsurface soils exhibit concentrations of metals that have been statistically demonstrated to belong to different populations, which precludes grouping all depths together in comparing site soils to background soils. Therefore, background comparison statistics, selection of chemicals of potential concern, exposure point concentrations, and risk calculations were performed separately for surface versus subsurface soil.

6.2.1 Data Used for the Risk Assessment

The available database considered for use in this risk assessment includes background and site-associated sample results from recent and earlier investigations. Data utilized in this risk assessment were comprised of validated analytical results of known or sufficient quality for use in quantitative risk calculations. The data were collected by Tetra Tech NUS (Phase III - 1997) and TRC (Phase I - 1990, Phase Ia - 1991, and Phase II - 1993). Surface soil samples were comprised of locations less than or equal to 1 foot in depth, and subsurface soil samples were less than 10 feet in depth (which corresponds to a hypothetical future scenario where soil disturbance during construction activities could result in the re-mixing and re-distribution of subsurface soils at the ground surface to allow human exposures to soil contaminants, although the likelihood of this scenario may be low). Sampling locations were identified for inclusion that were believed to be potentially within the radius of impact from of site-related activities; whereas sampling locations outside the realm of possible influence were considered as background areas.

6.2.2 Identification of COPCs

The selection of COPCs was based on chemical-specific concentrations, occurrence, distribution, and toxicity. COPCs were selected to represent site contamination and to provide the framework for the quantitative BLRA. COPCs include only those chemicals with positive detections at a suspected source concern.

A chemical was selected as a COPC if the maximum detected concentration was greater than the associated risk-based concentration (RBC) based on a target cancer risk of 1 X 10^{-6} or a noncancer hazard quotient (HQ) of 0.1. RBCs were obtained from the latest EPA Region 3 listing for residential soil exposure and fish consumption (EPA, 2000a). All exposures to soil or sediment for all receptors were conservatively screened using the residential exposure assumptions in the RBC table. RBCs that were based on noncancer effects were adjusted from a HQ of 1.0 to a HQ of 0.1 to protect against the possibility of additive toxic effects from multiple chemicals.

For surface soil and subsurface soil, COPCs for metals were eliminated from further consideration if the chemical was not present at a concentration demonstrated to be statistically greater than the levels found in background soils. Background comparison tests could not be performed for shellfish or sediment data sets because of lack of a sufficient number of background sample locations. However, a qualitative comparison of site and background samples for fish is presented within the risk assessment uncertainty discussion. The background data sets for surface and subsurface soil samples underwent preliminary testing and screening for potential outliers as described in an earlier report (TtNUS, 2000). The results of background comparison tests for surface and subsurface soils for all metals (not just candidate COPCs) are presented in Appendix Q, Tables Q-18 and Q-19.

The inorganic COPCs that were above screening levels but were able to be eliminated based on results not being above background levels include antimony in surface soil and cadmium in subsurface soil. An elevated concentration for a metal was indicated if there was found to be either an overall difference between the entire populations of site and background sample results (the t-test, the Mann-Whitney test, or Gehan's Test); if hot spots were found (the upper ranks test or the UTL test); or if no other tests were conclusive, an elevated frequency of detection in site versus background (the test of proportions or Fisher's Exact Test). These tests are explained in detail in Appendix Q-3.

Additional COPCs were included when only one member of a compound class exceeded RBC screening criteria but other members were detected at levels below RBC thresholds. COPCs were considered for inclusion based on related chemicals of the same family being present in the case of carcinogenic polyaromatic hydrocarbons (PAHs), the chemical degradation families (such as DDT-series analogs, PCE/TCE/1,1,1-TCA breakdown products), or a commercial formulation (such as technical chlordane components). For example, if DDT was detected above the RBC criterion, but DDD was present below the RBC criterion, then both chemicals were retained as COPCs in that medium.

Essential nutrients were not considered as COPCs, including calcium, chloride, magnesium, potassium, and sodium. In addition, several specific metals (aluminum, cobalt, copper, and iron) were excluded from consideration as COPCs because these substances have only provisional toxicity criteria, based on risk assessment guidance from EPA Region I (EPA, 1994c). Therefore, these common minerals/essential nutrients were not considered as potential inorganic COPCs.

Other detected chemicals that did not have published toxicity criteria from accepted references (EPA, IRIS, HEAST, or NCEA) were retained as COPCs for illustration to document cases in which a current lack of knowledge regarding toxicity adds uncertainty to the risk assessment.

Lead was evaluated as a potential COPC based on derived screening levels for residential soil. Per EPA Region I directive, a value of 400 mg/kg [Office of Solid Waste and Emergency Response (OSWER) Directive, EPA, 1994a] was used as the residential soil screening RBC level and was applied to surface soil, subsurface soil, and sediment. Lead was retained as a COPC in shellfish tissue assessment because no established RBC criteria are available for screening lead in fish.

The RBC for hexavalent chromium was used for COPC selection because speciation data (i.e., trivalent versus hexavalent) were not available for the soil and sediment samples collected at OFFTA. Similarly, the RBC for methyl mercury was used for COPC selection because the form of mercury at the site is unknown and methyl mercury is considered the most toxic form of mercury.

The COPC selections and the rationale for inclusion or exclusion of chemicals are documented in Tables 6-2.1 through 6-2.6 (RAGs D Table 2s). Data presentation tables for inorganic and/or organic constituents detected in surface soil, subsurface soil, sediment, lobster, clams, and mussels are presented in separate tables. Chemicals with a "Y" listed in the COPC selection column of each table were retained as COPCs for all quantitative risk calculations.

6.2.3 <u>Distributional Analysis of the Data</u>

This section presents the approaches taken for distributional analysis of the OFFTA Site analytical data. Distributional analysis of the sampling data is important in determining the EPC used to quantitatively estimate risks at the site. Statistical analyses discussed in this section adhere to the guidance referenced in several EPA and related publications (EPA, 1989a, 1989b, 1992a, 1992b, and 1996a; U.S. Navy, 1999a and 1999b). Before EPCs were estimated for each COPC, the underlying statistical distribution of data was determined for each COPC. The Shapiro-Wilk W test or the Shapiro-Francia Test (EPA, 1992a) were performed to determine if the data set of chemical concentrations matched the shape of a normal or lognormal distribution. [The latter test is required if there are greater than 50 samples (EPA, 1992a, 1996a).] Normally distributed data exhibit a characteristic "bell-shape" curve that is symmetrical, whereas lognormal data have a skewed shape with a longer tail at the high-concentration end. For each COPC, the W test was performed once using the original data and once after data were converted to their logarithms. A 5 percent level of significance was used to determine if the data deviated from either hypothesized distribution. If the W test indicated a normal distribution, then the estimation of the reasonable maximum exposure point concentration (using the upper 95th percentile confidence limit on the mean, as discussed in the next section) was based upon a normal distribution and standard deviation. If taking the natural logarithms (base e) of the data provided a better match than a normal distribution, a lognormal transformation of data was performed before the upper 95th percentile confidence limit on the mean concentrations was computed. If neither distribution matched the data set of interest, the distribution having the better apparent fit was selected.

The distributional analysis results for COPCs in surface soil, subsurface soil, sediment, lobster, clams, and mussels are shown in Appendix Q-2, Tables Q-12 through Q-17.

6.2.4 Exposure Point Concentrations

In this BLRA, an exposure point concentration (EPC) represents an estimated chemical concentration to which a receptor is assumed to be continuously exposed while in contact with an environmental medium. Using all of the analytical results for related samples, an EPC was calculated for each COPC identified in each media of concern at the OFFTA Site. The EPC was calculated using the latest risk assessment guidance from EPA (1985, 1989a, 1992d, 1994c, and 1998b) and Gilbert (1987).

6.2.4.1 Reasonable Maximum and Central Tendency Exposure EPCs

Two types of EPCs are possible for use in this HHRA, reasonable maximum exposure (RME) EPCs and central tendency exposure (CTE) EPCs. RME is the exposure that is expected to represent an upper-bound exposure in a given medium of interest. RME EPCs were selected from the maximum value, 95 percent upper confidence limit on the mean of normally distributed data (95 percent UCL-N), or the upper 95 percent upper confidence limit on log transformed data (95 percent UCL-T). As explained in Section 4.3.1, the RME EPC is the lower of the maximum value and the 95 percent UCL-N or 95 percent UCL-T (selected based on distribution of the data).

CTE is the exposure that is expected to represent an average exposure in a given medium of interest. Note: CTE analysis at OFFTA was performed only for those exposure pathways where the estimated cancer risks are above 1 x 10-4 and the non cancer HIs based on the same target organ are above 1.0. (CTE analysis not only involves a modified EPC, but also involves changes to input parameters for each exposure pathway.) CTE EPCs were selected as the statistical UCL identical to the UCL-N or UCL-T used for RME EPCs, except in those cases where the statistical UCL was greater than the maximum detected concentration (which may happen if trace level detections are all less than one-half of the quantitation limit). In the latter case, CTE used the minimum among the two quantities, mean or maximum detected concentration, as the CTE EPC.

RME and CTE EPCs for lead were calculated differently because the model is designed to accept the mean lead value and estimate the upper percentile of blood lead concentrations from this quantity. Therefore, in the case of lead, the candidate RME EPC was selected as the arithmetic mean of the lead concentration (for a normal distribution) or the minimum variance unbiased estimate of the mean (for a lognormal distribution). If the maximum detected lead concentration was less than this value, then the maximum was used in place of the mean.

6.2.4.2 Treatment of Data in EPC Calculations

Validated laboratory data were used to calculate EPCs for all data. Estimated values (J qualified) and biased values (L and K qualified) were used as the reported value. Rejected results (R qualified) were eliminated from further consideration. Blank-qualified results were treated as non-detects based on EPA regional data validation guidance.

For chemicals with at least one positive detection in each data set, a value of one-half the sample quantitation limit was assumed for non-detect (U qualified) results when calculating EPCs.

Duplicate samples were represented in the quantitative HHRA for a location as the maximum detected result of the two samples analyzed. (Note that background comparisons used averaged results of field duplicate samples.)

6.2.4.3 EPC Calculation

The calculation of an EPC involves two steps. First, the distribution of the data was determined as discussed in the preceding section. Then, based on the distribution of the data, an EPC was either calculated or selected.

Several important assumptions were used to evaluate the distribution of the data (Section 6.2.4):

- The distribution of a data set was determined using a Shapiro-Wilk test.
- The distributions were classified as lognormal, normal, or unknown.
- If the data were not determined to be either a lognormal or normal distribution, they were classified as the distribution having the better apparent fit.

- If less than 3 samples were available in the medium of concern, estimation of the distributional shape was not possible and the 95 percent UCL was not estimated.
- If less than 5 samples were available, the determination of distributional shape and the estimation of statistical upper confidence limits were not considered reliable or accurate because of inadequate sample size, and the maximum value was selected as the EPC in this case.

If the data were determined to be normally distributed, then the standard deviation of the sample set and the student's t-value were used to calculate the one-sided 95 percent UCL, as follows:

First, the standard deviation of the sample set was determined:

$$S = \sqrt{\sum\left(\frac{(X_i - \mu)^2}{n-1}\right)}$$

where:

S	=	Standard deviation of the data
X_i	=	Individual sample value
μ	=	Arithmetic mean of the n samples
n	=	Number of samples

The one-sided upper 95 percent confidence limit (95 percent UCL-N) was calculated as follows:

$$5\%\ \text{UCL-N} = \mu + \frac{(t * S)}{\sqrt{n}}$$

where:

S	=	Standard deviation of the data
t	=	One-sided t distribution factor
μ	=	Arithmetic mean of the n samples
n	=	Number of samples

For data considered to be lognormal, the standard deviation of the log-transformed sample set was determined as follows:

$$S = \sqrt{\sum\left(\frac{(X_i - \mu)^2}{n-1}\right)}$$

where:

S	=	Standard deviation of the log-transformed data
X_i	=	Individual sample value (log-transformed)
μ	=	Arithmetic mean of the log-transformed n samples
n	=	Number of samples

For data considered to be lognormal, the EPC was based on the 95 percent H-statistic upper confidence limit on log transformed data (95 percent UCL-T), calculated as follows:

$$95\%\ \text{UCL-T} = e^{\left[\mu + 0.5s^2 + \left(\frac{sH}{\sqrt{n-1}}\right)\right]}$$

where:

e	=	constant (base of the natural log, equal to 2.718)
μ	=	Arithmetic mean of the log-transformed data
H	=	H-statistic (e.g., from table published in Gilbert, 1987)
S	=	Standard deviation of the log-transformed data
n	=	Number of samples

The RME EPC was then selected as the lesser value of the one-sided 95 percent UCL and the maximum positive value in the data set.

For CTE, the mean was represented using the minimum variance unbiased estimate of the population's mean, according to Gilbert, 1987:

Mean-T = $\exp\{\mu_L\}\Psi_n(s_y^2/2)$

Where: μ_L = arithmetic mean of log-transformed data

s_y = standard deviation of log-transformed data

$\Psi_n(t)$, with $t = s_y^2/2$, is the infinite series:

$$\Psi_n(t) = 1 + (n-1)t/n + (n-1)^3t^2/(2!n^2(n+1)) + (n-1)^5t^3/(3!n^3(n+1)(n+3)) + (n-1)^7t^4/(4!n^4(n+1)(n+3)(n+5)) + \ldots$$

CTE EPCs were selected as the statistical UCL identical to the UCL-N or UCL-T used for RME EPCs, except in those cases where the statistical UCL was greater than the maximum detected concentration (which may happen if trace level detections are all less than one-half of the quantitation limit) In the latter case, CTE used the minimum among the two quantities, mean and maximum value, as the CTE EPC.

6.2.4.4 EPCs for Exposure Pathways

The RME and CTE EPCs for COPCs in surface soil, subsurface soil, sediment, lobster, clams, and mussels are shown on Tables 6-3.1 through 6-3.6 (RAGs D Table 3s).

6.3 EXPOSURE ASSESSMENT

The exposure assessment evaluates the potential for human exposure to the chemicals detected in the environmental media of concern at the OFFTA Site investigated during the RI. This section presents a characterization of the exposure setting, characterizes the exposed populations, identifies actual or potential exposure routes, and summarizes the methods used to generate exposure estimates. The nature and extent of contamination for each media of concern for which exposures were based were presented in the RI Report (TtNUS, 2000 Section 4.0).

6.3.1 Characterization of the Exposure Setting

OFFTA is located at the northern end of Coasters Harbor Island. The site occupies approximately 5.5 acres and is bordered to the west, north, and east by Narragansett Bay and Coasters Harbor.

The site is relatively flat, except for two soil mounds: one that is approximately 20 feet high located in the center of the site, and another that is approximately 6 feet high located on the western side of the site. Both mounds are reported to contain rubble from demolition of the fire training structures. The top layer of soil across the site (approximately 6 inches) is fill that was placed after the fire training area was closed. With the exception of the baseball infield and beneath the playground equipment, the site is entirely vegetated with grass. The surface of the baseball field is imported soil; imported sand is beneath all playground equipment. Several small and medium sized trees are located on the central mound and eastern side of the site

With the exception of the soil mounds, the surface elevation of Katy Field ranges from approximately 8 to 12 feet above MLW. At the edge of the field, the land drops steeply to a rocky shoreline. Large conglomerates and pieces of concrete, asphalt, and other rubble are present on the shoreline along the edge of the field to act as a seawall and prevent erosion. The shoreline sediment is comprised principally of coarse sands.

The climate information presented below was obtained from the TRC Draft Final RI (TRC, 1994), which derived much of the information from the IAS report (Envirodyne Engineers, 1983).

The climate at NSN is influenced by its proximity to Narragansett Bay and the Atlantic Ocean, which tend to modify the area's temperatures. Winter temperatures are somewhat higher and summer temperatures lower than more inland areas. Winters are moderately cold in the area, and summers are generally mild with many summer days cooled by sea breezes.

The average annual precipitation for the area is 42.75 inches. Measurable precipitation (0.01 inch or greater) occurs on about one day out of every three and is evenly distributed throughout the year. The average snowfall during winter is close to 40 inches. February is usually the month of greatest snowfall, but January and March are close seconds. It is unusual for the ground to remain snow covered for any long period of time.

The probability of a tropical cyclone (winds 39 to 73 miles per hour) in the NSN area is one in five in any year, while the probability of hurricane force winds (winds greater than 73 miles per hour) in the area is less than one in fifteen in any year (Outleasing EIS, 1977). The most damage from these severe storms results when the storms strike at high tide.

6.3.2 Potential Receptors

The potential receptors chosen for OFFTA Site are presented in this section. All of the receptors listed below are not applicable to every medium of concern. Scenario timeframes and receptor-specific media of exposures for the on/off-site receptors are presented in Table 6-1 (RAGs D Table 1) and were selected based on several criteria (i.e., current and anticipated future land use, accessibility to the site, and media of concern sampled). These receptors are listed as follows:

- Future Residential Child - This receptor is a child (age 1 - 6) who resides at or near the OFFTA Site. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil or subsurface soil. This receptor is also potentially exposed to sediment via ingestion and dermal absorption of COPCs in sediment.

- Future Residential Adult - This receptor is an adult (24 years exposure duration) who resides at or near the OFFTA Site. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil or subsurface soil. This receptor is also potentially exposed to sediment via ingestion and dermal absorption of COPCs in sediment.

- Future Lifetime Resident - This receptor is a residential child (age 1 - 6) and a residential adult (24 years exposure duration) who resides at or near the OFFTA Site. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil or subsurface soil. This receptor is also potentially exposed to sediment via ingestion and dermal absorption of COPCs in sediment. (This additive residential exposure scenario is included to estimate the lifetime cancer risk under a residential land use scenario. The lifetime cancer risk is estimated by adding the cancer risk under a 24-year adult exposure to the cancer risk under a 6-year child exposure.)

- Current/Future Recreational Child (soil contact) - This receptor is a child (age 1 - 4) who visits the OFFTA Site. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil. The preschool age range was selected to account for use of the Katy Field area as a daycare center for children.

- Current/Future Recreational Pre-Adolescent/Adolescent (soil contact) - This receptor is a child (age 5 - 12) who visits the OFFTA Site. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil. The age range was selected to account for use of the Katy Field area for sports and recreational activities for elementary school age children.

- Current/Future Recreational Adult (soil contact) - This receptor is an adult (18 years exposure duration) who resides at or near the OFFTA Site. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil.

- Current/Future Recreational Lifetime Receptor (soil contact) - This receptor is a recreational child (age 1 - 4), a recreational pre-adolescent/adolescent (age 5-12), and a recreational adult (18 years exposure duration) who resides at or near the OFFTA Site (total exposure duration 30 years). This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil. (This additive recreational exposure scenario is included to estimate the lifetime cancer risk under a recreational land use scenario. The lifetime cancer risk is estimated by adding the cancer risk under a 18-year adult exposure scenario to the cancer risk under an 8-year duration pre-adolescent/adolescent exposure to the cancer risk under a 4-year child exposure.)

- Current/Future Shoreline Visitor Child - This receptor is a child (age 1 - 4) who visits the OFFTA Shoreline area This receptor is potentially exposed to sediment via ingestion and dermal absorption of COPCs in sediment. The preschool age range was selected to account for use of the Katy Field area as a daycare center for children.

- Current/Future Shoreline Visitor Pre-Adolescent/Adolescent - This receptor is a child (age 5 - 12) who visits the OFFTA Shoreline area. This receptor is potentially exposed to sediment via ingestion and dermal absorption of COPCs in sediment. The age range was selected to account for use of the Katy Field area for sports and recreational activities for elementary school age children.

- Current/Future Shoreline Visitor Youth (cumulative exposure) - This receptor is a child (age 1 - 4) and a pre-adolescent/adolescent (age 5-12) who engages in sports or recreational activities at the OFFTA Site (total exposure duration 12 years). This receptor is potentially exposed to sediment via ingestion and dermal absorption of COPCs. (This additive exposure scenario is included to estimate the cumulative cancer risk for a child who frequents the site shoreline area throughout his or her pre-adolescent years. The lifetime cancer risk is estimated by adding the cancer risk under an 8-year duration pre-adolescent/adolescent exposure to the cancer risk under a 4-year child exposure.)

- Future Recreational Child (fishing) - This receptor is a child (age 1 - 6) whose family member(s) fish within the OFFTA shoreline area and who consumes locally caught fish. This receptor is potentially exposed to fish tissue via ingestion of COPCs in blue mussels, lobster, or clams.

- Future Recreational Adult (fishing) - This receptor is an adult who fishes within the OFFTA shoreline area and consumes locally caught fish (exposure duration 24 years). This receptor is potentially exposed to fish tissue via ingestion of COPCs in blue mussels, lobster, or clams.

- Future Recreational Lifetime Receptor (fishing) - This receptor is a recreational child (age 1 - 6) and a recreational adult (24 years exposure duration) who fishes within the OFFTA shoreline area and consumes locally caught fish (total exposure duration 30 years). This receptor is potentially exposed to fish tissue via ingestion of COPCs in blue mussels, lobster, or clams. (This additive recreational exposure scenario is included to estimate the lifetime cancer risk under a recreational land use scenario. The lifetime cancer risk is estimated by adding the cancer risk under a 24-year adult exposure to the cancer risk under a 6-year child exposure.)

- Future Subsistence Fisherman - This receptor is an adult who fishes continuously throughout the year within the OFFTA shoreline area and consumes on a daily basis locally caught fish (exposure duration 24 years). This receptor is potentially exposed to fish tissue via ingestion of COPCs in blue mussels, lobster, or clams.

- Future Excavation Worker - This receptor is an adult who is exposed to with soil at the OFFTA Site during work-related construction activities. This receptor is potentially exposed to soil via ingestion, dermal absorption, and inhalation (fugitive dust) of COPCs in surface soil or subsurface soil.

6.3.3 Exposure Estimates

The estimation routes, methods, and models presented in this section are consistent with current EPA risk assessment guidance (EPA, 1989a, 1992c, 1992e, 1993a, 1993b, 1994c, 1995, 1996b, 1997b, 1997c, 1998a). Exposure estimates associated with each exposure route are presented below. All exposure scenarios incorporate RME and CTE EPCs in the estimation of intakes. There are six environmental media sampled at the OFFTA Site through which potential receptors (see previous section) can be either directly or indirectly exposed to site-related COPCs: surface soil, subsurface soil, sediment, lobsters, clams, and blue mussels. Table 6-1 (RAGs D Table 1) presents a summary of the exposure pathways including scenario timeframes, media of exposure, potential receptors, and routes of exposure applicable to the OFFTA Site.

Noncarcinogenic risks were estimated using the concept of an average annual exposure. The intake incorporates terms describing the exposure time and/or frequency that represent the number of hours per day and the number of days per year that exposure occurs. This is used along with the "averaging time," which converts the total annual exposure to an average daily dose by dividing by 365 days per year of exposure. Noncarcinogenic risks for some exposure routes (e.g., soil) were generally greater for children than for adults because of differences in body weight and intake. Carcinogenic risks, on the other hand, were estimated as an incremental lifetime risk and, therefore, incorporate terms to average the exposure duration (years) over the course of a lifetime (70 years).

6.3.3.1 Surface Soil and Subsurface Soil Exposure Estimates

Three potential exposure routes were associated with direct exposure to surface and subsurface soil at the OFFTA Site. These exposure routes include ingestion, dermal absorption, and inhalation of fugitive dust. All three exposure routes were evaluated for surface soil using the future residential child, future residential adult, future lifetime resident (cancer risk only), future excavation worker, current/future recreational child, current/future recreational pre-adolescent/adolescent, current/future recreational adult, and current/future recreational lifetime receptor (cancer risk only). Subsurface soil exposure routes were evaluated for residential and excavation worker receptors. The exposure scenario for subsurface soil is hypothetical and assumes that re-mixing of soil might occur such that subsurface soil becomes surface soil and is available for direct contact with receptors. These receptors were chosen because they are expected to be representative of typical residential, recreational visitor, or construction exposures at the OFFTA Site.

For fugitive dust emissions under the future residential and current/future recreational exposure, the fraction of vegetative surface cover was assumed to be 50 percent of the surface area. Derivation of the particle emission factor is presented in EPA (1996c) - Soil Screening Guidance. Concentrations of VOCs in surface soil do not exceed inhalation of volatile SSL's (soil screening levels; EPA, 1996c), therefore, this exposure pathway is not quantitatively evaluated in this HHRA.

RME and CTE input parameters selected for surface and subsurface soil exposure pathways are shown for all receptors in Tables 6-4.5 through 6-4.13 and in Tables 6-4.18 through 6-4.26.

All input parameters for soil exposure in this BLRA were developed during discussions with EPA, Navy, and independent risk experts at a meeting held at NSN on January 13, 1999 and were refined based on additional follow-up communications among these parties. Rationale for each exposure input parameter and equations used for risk calculations are presented in separate tables, one for each combination of receptor, exposure medium, and exposure pathway (Tables 6-4.5 through 6-4.13 and Tables 6-4.18 through 6-4.26). The only input values not shown on the exposure input tables are the chemical specific absorption factors for the dermal pathway. These values are provided by EPA Region I and for soil COPCs are as follows (EPA Region I, 1998a): antimony (1 percent), arsenic (3 percent), chromium (1 percent), manganese (1 percent), nickel (1 percent), Aroclor-1254 (14 percent), carcinogenic PAHs (13 percent), and 2,3,7,8-TCDD Equivalents (3 percent). The value presented for cadmium (0.1 percent) was obtained from EPA, 1992e. Derivation of the surface areas (used in all dermal exposure equations in this risk assessment) for each of the receptors was based upon the sum of the values for contributing body parts. These were derived from several sources (EPA, 1997b and EPA, 1985) and are shown in detail in a table in Appendix Q. This table also shows the input values used to derive the average body weights for the age-range categories including the recreational child (age 1 - 4), the recreational pre-adolescent (age 5 - 12), and the residential child (age 1 - 6). Sample calculations for ingestion, dermal absorption, and inhalation of fugitive dust of COPCs in soil are provided in Appendix Q.

6.3.3.2 Sediment Exposure Estimates

Two potential exposure routes were associated with direct exposure to shoreline sediment at the OFFTA Site: ingestion and dermal absorption. Both exposure routes were evaluated using the future residential child, future residential adult, future lifetime resident (cancer risk only), current/future shoreline visitor child, current/future shoreline visitor pre-adolescent/adolescent, and current/future shoreline visitor youth (child plus adolescent - additive exposures for cancer risk only). These receptors were chosen because they are expected to be representative of typical residential or visitor exposures at the OFFTA Site.

No fugitive dust emissions were anticipated for sediments because this medium is expected to remain underwater or wet at all times. Concentrations of VOCs in sediment do not exceed inhalation of volatile SSL's (soil screening levels; EPA, 1996b), therefore, this exposure pathway is not quantitatively evaluated in this HHRA.

RME and CTE input parameters selected for sediment exposure pathways are shown for all receptors in Tables 6-4.1 through 6-4.4 and in Tables 6-4.14 through 6-4.17.

All input parameters for sediment exposure in this BLRA were developed during discussions with EPA, Navy, and independent risk experts and were refined based on several follow-up communications among these parties. Rationale for each exposure input parameter and equations used for risk calculations are presented in separate tables, one for each combination of receptor, exposure medium, and exposure pathway (Tables 6-4.1 through 6-4.4 and Table 6-4.14 through 6-4 17). The only input values not shown on the exposure input tables are the chemical specific absorption factors for the dermal pathway. These values are provided by EPA Region I and for sediment COPCs are as follows (EPA Region I, 1998a): antimony (1 percent), arsenic (3 percent), chromium (1 percent), manganese (1 percent), nickel (1 percent), Aroclor-1254 (14 percent), carcinogenic PAHs (13 percent), and 2,3,7,8-TCDD Equivalents (3 percent). Derivation of the surface areas (used in all dermal exposure equations in this risk assessment) for each of the receptors was based upon the sum of the values for contributing body parts. These were derived from several sources (EPA, 1997b and EPA, 1985) and are shown in detail in a table in Appendix Q. This table also shows the input values used to derive the average body weights for the age-range categories including the shoreline visitor child (age 1 - 4), the shoreline visitor pre-adolescent (age 5 - 12), and the residential child (age 1 - 6). Sample calculations for ingestion and dermal absorption of COPCs in sediment are provided in Appendix Q.

6.3.3.3 Fish Tissue Exposure Estimates

Ingestion exposure to COPCs present in lobster, clams, and blue mussels were evaluated using the future subsistence fisherman, future recreational child (age 1 - 6), future recreational adult (24 year exposure duration), and future recreational lifetime receptor (cancer risk only). These receptors were chosen because they are expected to be representative of typical recreational fishing exposures at the OFFTA site. The subsistence fishing scenario is presented as a hypothetical worst case. This scenario does not currently exist and is unlikely in the future because of the current ban on shellfishing in the area, the unrealistic assumption that all of the fisherman's catch would be obtained continually from waters adjacent to the OFFTA site, and because there are no local cultures (such as Native Americans) involved in subsistence fishing in this area.

RME and CTE input parameters selected for shellfish tissue exposure pathways are shown for all receptors in Tables 6-4.27 through 6-4.29.

All input parameters for fish tissue exposure were reviewed by EPA, Navy, and independent risk experts. Fish tissue exposure parameters were adapted from values used under a previous study conducted at a Naval facility in Rhode Island (Derecktor Shipyard). For the future recreational adult, shellfish ingestion rates of 1200 mg/day and 350 days of exposure per year were calculated to represent the equivalent exposure based upon an estimate of seafood serving sizes (150,000 mg/meal) and Rhode Island survey data on the number of hard-shell clam meals eaten per year (2.9 meals/year) provided by RIDEM (Narragansett Bay project, n d.). For the future recreational child, shellfish ingestion rates of 396 mg/day and 350 days of exposure per year were calculated to represent the equivalent exposure based upon an estimate of seafood serving sizes (48,000 mg/meal or 32 percent of the adult meal) and Rhode Island survey data on the number of hard-shell clam meals eaten per year (2.9 meals/year) provided by RIDEM (Narragansett Bay project, n.d). Child shellfish ingestion rates were not directly available, so ingestion rates were estimated as the average from three studies where the ratio of child versus adult ingestion rates were reported - 26 percent (Rupp, 1980); 33 percent (EPA, 1989a); and 38 percent (EPA, 1991).

For the recreational receptors, shellfish consumption rates are based on the assumption that a recreational collector/consumer of shellfish eats shellfish from the study area on an occasional basis only, and this source represents only a fraction of the consumer's shellfish diet. Other shellfish consumption rates reported in various studies (FDA, 1993, and Narragansett Bay project, n.d.) provide estimates of a person's entire shellfish diet, from all sources, and would represent overconservative estimates of the recreational receptor's intake of shellfish collected from the OFFTA shoreline area.

For the future subsistence fisherman, shellfish ingestion rates of 20,000 mg/day and 350 days of exposure per year were calculated to represent the equivalent exposure based on an estimate of adult typical peak yearly seafood serving sizes (150,000 mg/meal) and Rhode Island survey data on the number of shellfish meals eaten per year (47 meals/year) provided by RIDEM (Narragansett Bay project, n.d.).

Rationale for each exposure input parameter and equations used for risk calculations are presented in separate tables, one for each combination of receptor, exposure medium, and exposure pathway (Tables 6-4.27 through 6-4.29). Sample calculations for ingestion of COPCs in fish tissue are provided in Appendix Q.

6.4 TOXICITY ASSESSMENT

Toxicity Assessment identifies the potential health hazards associated with exposure to each of the COPCs. A toxicological evaluation characterizes the inherent toxicity of a compound. The literature indicates that the COPCs have the potential to cause carcinogenic and/or noncarcinogenic health effects in humans. Although the COPCs may cause adverse health effects, dose-response relationships and the potential for exposure must be evaluated before the risks to receptors can be determined. Dose-response relationships correlate the magnitude of the intake with the probability of toxic effects, as discussed below. Toxicity information for the COPCs in surface soil, subsurface soil, sediment, lobster, clams, and blue mussels at the OFFTA Site are presented in Tables 6-5.1, 6-5.2, 6-6.1, and 6-6.2 (RAGs D Tables 51, 5.2, 6.1, and 6.2, respectively) and Appendix Q in the form of toxicological profiles.

An important component of the risk assessment process is the relationship between the intake of a compound (the amount of a chemical that is absorbed by a receptor) and the potential for adverse health effects resulting from exposure to that dose. Dose-response relationships provide a means by which potential public health impacts can be quantified. The published information of doses and responses is used in conjunction with information on the nature and magnitude of human exposure to develop an estimate of potential health risks.

Dose-response values [reference doses (RfDs) and slope factors (SFs)] have been developed by EPA and other sources for many organics and inorganics. This section provides a brief description of these parameters.

6.4.1 Reference Doses

The RfD is developed by EPA for chronic and/or subchronic human exposure to hazardous chemicals and is based solely on the noncarcinogenic effects of chemical substances. Subchronic RfDs are specifically developed to be protective for a portion of a lifetime exposure to a compound (as a Superfund program guideline, short term). Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (as a Superfund program guideline, long term). The RfD is usually expressed as a dose (mg) per unit body weight (kg) per unit time (day). It is generally derived by dividing a No-Observed-(Adverse)-Effect-Level (NOAEL or NOEL) or a Lowest-Observed-Adverse-Effect-Level (LOAEL) by an appropriate uncertainty factor. NOAELs, etc. are determined from laboratory or epidemiological toxicity studies. The uncertainty factor is based on the availability of toxicity data.

Uncertainty factors are generally applied as multiples of 10 to represent specific areas of uncertainty in the available data. A factor of 10 is used to account for variations in the general population (to protect sensitive subpopulations), when test results from animals are extrapolated to humans (to account for interspecies variability), when a NOAEL derived from a subchronic study (instead of a chronic study) is used to develop the RfD, and when a LOAEL is used instead of a NOAEL. In addition, EPA reserves the use of a modifying factor of up to 10 for professional judgment of uncertainties in the database not already accounted for. The default value of the modifying factor is 1.

The RfD incorporates the surety of the evidence for chronic human health effects. Even if applicable human data exist, the RfD (as diminished by the uncertainty factor) still maintains a margin of safety so that chronic human health effects are not underestimated. Thus, the RfD is an acceptable guideline for evaluation of noncarcinogenic risk, although the associated uncertainties preclude its use for precise risk quantitation. Oral and dermal RfDs, primary target organs, uncertainty/modifying factors, and sources of noncancer toxicity information for COPCs are provided in Table 6-5.1 (RAGs D Table 5.1). Inhalation RfDs, primary target organs, uncertainty/modifying factors, and sources of toxicity information for selected COPCs in soil are provided in Table 6-5.2 (RAGs D Table 5.2). Inhalation RfDs (mg/kg/day) were derived from inhalation reference concentrations (RfCs) (mg/m^3) by dividing by 70 kg (an assumed human body weight), multiplying by 20 m^3/day (an assumed human inhalation rate), and adjusting by an appropriate absorption factor (EPA, 1997b).

Target organ data have been extracted from the Integrated Risk Information System (IRIS; EPA, 2000b), Health Effect Assessment Summary Tables (HEAST; EPA, 1997b), or other applicable sources. Only the target organs that are affected in the applicable study in which the RfD was derived have been included in Tables 6-5.1 and 6-5.2 (RAGs D Tables 5.1 and 5.2, respectively).

Noncarcinogenic risks for lead were not quantified and compared to RfDs, because EPA has implemented an approach to evaluating lead risks that does not provide a single-point estimate output. Instead, potential lead exposures are evaluated using a biokinetic model to estimate expected blood-lead increases. The blood-lead model is discussed in Section 6.5.6. A discussion of the results of the blood-lead model estimates is presented in Section 6.4.8.

6.4.2 Cancer Slope Factors (SFs)

SFs are applicable for estimating the lifetime probability (assumed 70-year lifespan) of human receptors developing cancer as a result of exposure to known or potential carcinogens. This factor is generally reported in units of 1/(mg/kg/day) and is derived through an assumed low-dosage linear relationship of extrapolation from high to low dose responses determined from animal studies. The value used in reporting the slope factor is the upper 95 percent confidence limit.

Oral and dermal SFs, weight of evidence, and sources of toxicity information for selected COPCs are provided in Table 6-6.1 (RAGs D Table 6-1). Inhalation SFs, weight of evidence, and sources of toxicity information for selected COPCs in soil are provided in Table 6-6.2 (RAGs D Table 6-2). Inhalation SFs $(mg/kg/day)^{-1}$ were derived from inhalation unit risks $(ug/m^3)^{-1}$ by multiplying by 70 kg (an assumed human body weight), dividing by 20 m^3/day (an assumed human inhalation rate), and multiplying by the appropriate conversion factor (1000 ug/mg) (EPA, 1997b).

Carcinogenic risks for lead were not quantified, because EPA has not published a SF for inorganic lead. Instead, potential lead exposures were evaluated using a biokinetic model to estimate expected blood-lead increases. A discussion of these results is presented in Section 6.4.8.

6.4.3 EPA Weight of Evidence

The weight-of-evidence designations indicate the preponderance of evidence regarding carcinogenic effects in humans and animals. The categories are defined as follows (EPA, 1992c):

WEIGHT OF EVIDENCE CATEGORY	DEFINITION
A	Known human carcinogen
B1	Probably human carcinogen, limited human data are available
B2	Probable human carcinogen, sufficient animal data are available but inadequate human data are available
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity
E	Evidence of noncarcinogenicity in humans

6.4.4 Adjustment of Dose-Response Parameters for Dermal Exposure

Risks associated with dermal exposures were evaluated using toxicity values that are specific to absorbed dermal doses. Most oral toxicity values are based on administered doses rather than absorbed doses. Therefore, in accordance with EPA Region I (1998a) and EPA (1989a, Appendix A) guidance, the toxicity values based on administered doses were adjusted before they were used for evaluating absorbed doses.

Dermal RfDs and SFs were obtained from oral RfDs and SFs via the following relationships:

$$RfD_{Adjusted} = RfD_{Oral} * GI_{Oral}$$

$$SF_{Adjusted} = {SF_{Oral}}/{GI_{Oral}}$$

where:

GI_{Oral} = Gastrointestinal (GI) Absorption Efficiency (EPA, 1998a)

RfD_{Oral} = Oral Reference Dose (EPA, 2000a; EPA, 2000b; EPA, 1997a; or EPA-NCEA)

SF_{Oral} = Oral Slope Factor (EPA, 2000a; EPA, 2000b; EPA, 1997a; or EPA-NCEA)

Dermally adjusted RfDs and SFs for COPCs are presented in Tables 6-5.1 (RAGs D Table 5.1) and 6-6.1 (RAGs D Table 6-1), respectively.

6.4.5 Carcinogenicity of PAHs

Carcinogenic PAHs are related by chemical structure. Only benzo(a)pyrene has an EPA published SF (EPA, 2000b). All other carcinogenic PAHs except carbazole have SFs based on their potency relative to benzo(a)pyrene. The relative potency factors (RPF) for carcinogenic PAH COPCs at the OFFTA Site were as follows: (EPA, 2000b):

- Benzo(a)pyrene (RPF = 1.0)
- Benz(a)anthracene (RPF = 0.1)
- Benzo(b)fluoranthene (RPF = 0.1)
- Benzo(k)fluoranthene (RPF = 0.01)
- Chrysene (RPF = 0.001)
- Dibenz(a,h)anthracene (RPF = 1.0)
- Indeno(1,2,3-cd)pyrene (RPF = 0.1)

6.4.6 Toxicity Criteria for Chromium

The toxicity criteria for hexavalent chromium (Cr^{+6}) were used in this BLRA evaluation because speciation data (i.e , trivalent versus hexavalent) were not available for samples collected in areas/media of concern at the OFFTA Site. Hexavalent chromium was considered to be more toxic than trivalent chromium, therefore, this assumption is conservative in nature.

6.4.7 Toxicity Criteria for Mercury

The toxicity criteria for methyl mercury were used in this BLRA evaluation because data indicating the form of mercury in environmental media was not available at the OFFTA Site. Methyl mercury was considered to be more toxic than inorganic mercury, therefore, this assumption is conservative in nature.

6.4.8 Blood-Lead Modeling

As outlined in OSWER Directive 9355.4-12, EPA (1994a) has developed an approach to evaluating lead risks that recognizes the multimedia nature of lead exposures, incorporating absorption and pharmacokinetic information. Research has been conducted concerning lead intake and resultant blood-lead levels. Determinations of lead uptake from soil, sediment, and fish tissue were considered. Potential blood-lead level increases are estimated and are discussed, along with the potential implications of blood-lead results for residential children and subsistence fishermen. The following discussion presents information that is useful in estimating lead exposure.

No threshold has been defined for effects related to blood-lead increases. Effects below blood-lead levels of 10 ug/dL are difficult to define. Inhibition of certain enzymes involved in red blood cell metabolism has been reported to occur at 10 to 15 ug/dL and possibly lower. Small increases in blood pressure have been observed in adults with blood-lead levels down to 7 ug/dL (EPA, 1994b). The most sensitive subpopulation to effects below 7 ug/dL, would be infants, whose early neurological development can be affected by blood-lead concentrations reportedly down to 5 ug/dL (EPA, 1994b). Lead is also a fairly common environmental contaminant and, for this reason, typical blood-lead levels in the population at large may already exceed the concentrations discussed here

For drinking water exposure, children 0 through 6 months old are expected to experience blood lead increases at the rate of 0.26 ug/dL per ug/L lead in water up to 15 ug/L and at the rate of 0.04 ug/dL for every ug/L lead in water above 15 ug/L (EPA, 1994b). For older children, the ratio is 0.12 ug/dL blood lead per ug/L lead in water up to 15 ug/L and 0.06 ug/dL for every ug/L lead in water above 15 ug/L (EPA, 1994b). For adults, the ratio is approximately 0.06 ug/dL blood lead per ug/L in water (EPA, 1994b). Dietary intake of lead is assumed to produce increases of 0.02 to 0.04 ug/dL blood lead per ug/day ingested by adults and 0.16 ug/dL blood lead per ug/day ingested by infants (EPA, 1986a). Blood-lead levels are estimated to increase by 0.6 to 6.8 ug/dL per 1,000 mg/kg lead in soil (EPA, 1986a).

Blood-lead levels resulting from soil or sediment exposure in residential children (age 1 - 6) and from fish tissue ingestion in recreational children (age 1 - 6) were estimated using the Integrated Exposure and Uptake Biokinetic (IEUBK) Model (version 0.99) developed by EPA (EPA, 1994b). The model is applied using the soil, sediment, or fish tissue EPCs in each applicable medium of concern where lead was selected as a COPC at the OFFTA Site (See Site Specific RME and CTE EPC tables for specific lead values).

The output of the IEUBK Model is a histogram that presents the estimated percentage of children with a blood-lead level above 10 ug/dL (considered to be the threshold significance level above which adverse effects cannot be ruled out). When the percentage of the population estimated to have blood-levels above

10 ug/dL is greater than five percent, then EPA considers the potential for adverse effects to be significant (EPA, 1994a). These histograms, along with input information particular to each run of the IEUBK model, are presented in Appendix A (Part 10). The estimated percentages of children with blood-lead levels above 10 ug/dL are also presented in Section 6.5.6. Uncertainties associated with the IEUBK model are discussed in Section 6.6.4.

For the assessment of lead in shellfish consumed by recreational children and lead in surface soil, subsurface soil, and sediment ingested by residential children, default values in the model are used to represent background lead concentrations in air, house dust, water, and the level of maternal contribution. Additionally, the model's default values are used to represent respiratory rate, soil and water ingestion rates, and the percent of lead absorption by the various exposure routes. The only site-specific factor put into the IEUBK model is the concentration of lead (EPC) in each medium of interest.

Noncarcinogenic risks for subsistence fishermen from exposures to lead in lobster, clams, and blue mussels were estimated using the Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil (EPA, 1996). The intake assumptions used in the model are the lead concentrations (EPCs) in shellfish at the site, the shellfish ingestion rate, and an exposure frequency. The model is based on a biokinetic slope factor that estimates fetal blood lead concentration in women exposed to lead contaminated soil. A simplified (linear) representation of lead biokinetics is used to predict quasi-steady state blood lead concentrations among adults who have relatively steady patterns of site exposures (exposure duration of at least 90 days and exposure frequencies greater than once per week).

The biokinetic model input parameters were a biokinetic slope factor (ug/dl adult blood lead per ug/day uptake) of 0.4, a constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration of 0.9, a fish tissue lead absorption factor of 0.12 (equal to the product of the relative bioavailability of lead in food of 0.6 and a soluble lead absorption factor of 0.2), a background blood lead (typical concentration for women of child bearing age not exposed to the site) of 1.7 ug/dl, and a geometric standard deviation of 1.8 (representative of a relatively homogeneous population demographic.

6.4.9 Constituents for Which EPA Has Not Developed Toxicity Criteria

The COPCs for which EPA has not developed toxicity values are excluded from the quantitative risk characterization. These COPCs include 5 PAHs (1-methylnaphthalene, 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, benzo(e)pyrene, and perylene); dibenzothiophene; 4-chloro-3-methylphenol; and 4,6-dinitro-2-methylphenol. Neither screening criteria (RBCs) nor EPA toxicity information (RfDs and SFs) are available for these chemicals. In addition, phenanthrene, benzo(g,h,i)perylene, and acenaphthylene also do not have published EPA toxicity criteria. Therefore, risks for these chemicals were not evaluated quantitatively in the risk characterization. However, in the case of phenanthrene, benzo(g,h,i)perylene, and acenaphthylene, RBC screening criteria were applied using a surrogate (similar PAH), naphthalene, which is consistent with previous EPA Region I risk assessment projects and which resulted in these chemicals found to be below screening levels in all media.

6.5 RISK CHARACTERIZATION

Potential human health risks resulting from the exposures outlined in the preceding sections are characterized on a quantitative and qualitative basis in this section. Quantitative risk estimates were generated based on risk assessment methods outlined in current EPA guidance (EPA, 1989a).

Noncarcinogenic risk estimates were presented in the form of HQs and HIs that are determined through comparison of estimated intakes with published RfDs. Incremental cancer risk estimates were provided in the form of dimensionless probabilities based on SFs.

Estimated human intakes were developed for each of the specific exposure routes discussed in the preceding sections. Both noncarcinogenic and carcinogenic risks were summarized for each exposure route on a series of tables in this section.

For COPCs excluded from quantitative risk characterization because of lack of toxicity data, a qualitative evaluation of risks is presented in the uncertainty section, 6.6.3.1.

6.5.1 Noncarcinogenic Risks

Noncarcinogenic risk was assessed using the concept of HQs and HIs. The HQ is defined as the ratio of the estimated intake and the RfD for a selected chemical of concern, as follows:

$$HQ = \frac{Intake}{RfD}$$

HIs were generated by summing the individual HQs for the COPCs. If the value of the HI exceeds unity (1.0), the potential for noncarcinogenic health risks associated with exposure to that particular chemical mixture cannot be ruled out (EPA, 1986b). In that case, particular attention should be paid to the target organ(s) affected by each chemical because these are generally the organ(s) associated with RfD-derived effects, and results (HIs) for different organs are not truly additive. The HI is not defined as a mathematical prediction of the severity of toxic effects; it is simply a numerical indicator of exceedence of the acceptable threshold for noncarcinogenic effects. Above an HI of 1, toxic effects would not necessarily occur, but can no longer be ruled out.

6.5.2 Carcinogenic Risks

Incremental cancer risk (ICR) estimates were generated for each of the exposure pathways using the estimated intakes and published SFs, as follows:

$$Risk = Intake * SF$$

If the above equation results in a risk greater than 0.01, the following equation was used:

$$Risk = 1 - e^{-(Intake*SF)}$$

The risk determined using these equations is defined as a unitless expression of an individual's increased likelihood of developing cancer as a result of exposure to carcinogenic chemicals. An ICR of 1×10^{-6} indicates that the exposed receptor has a one in a million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million persons. The calculated cancer risks should be recognized as upper-limit estimates. SFs are defined as the upper 95 percent confidence limit of a dose-response curve generally derived from animal studies. Actual human risk, while not identifiable, is not expected to exceed the upper limit based on the SFs and may, in fact, be lower.

EPA has generally defined risks in the range of 1×10^{-4} to 1×10^{-6} as being acceptable for most hazardous waste facilities addressed under CERCLA. For CERCLA activities, residual risks on the order of 10^{-6} are the primary goal but are often modified by such regulatory requirements as MCLs or chemical-specific clean-up goals.

6.5.3 Comparison of Quantitative Risk Estimates to Benchmark Criteria

In order to interpret the quantitative risks and to aid risk managers in determining the need for remediation at a site, quantitative risk estimates are compared to typical benchmarks.

An HI exceeding unity (1) indicates that there may be potential noncarcinogenic health risks associated with exposure. If a HI exceeds unity, target organ effects from individual COPCs contributing to the risk are considered. Only those chemicals that impact the same target organ(s) or exhibit similar critical effect(s) will be regarded as truly additive. Thus, COPCs contributing to an HI greater than 1 on the basis of a single target organ/effect are considered to be COCs.

EPA has defined the range of 1 x 10^{-4} to 1 x 10^{-6} as the incremental cancer risk (ICR) "target range" for most hazardous waste facilities evaluated. Cumulative ICRs greater than 1 x 10^{-4} generally indicate that EPA will require some degree of remediation, and ICRs below 1 x 10^{-6} normally will not require that EPA initiate remedial efforts. Whenever ICRs fall between 1 x 10^{-4} to 1 x 10^{-6}, decisions for remediation will be made on a case-specific basis. Individual chemicals contributing significantly to risks above the target range are considered to be chemicals of concern (COCs). In addition, RIDEM has defined a threshold of 1 X 10^{-5} as the incremental cancer risk (ICR) for consideration for remediation. Both benchmarks will be referenced in the discussion of risk characterization at the OFFTA Site.

Potential RME hazard indices and RME cancer risks were estimated for current and future potential receptors using the methodologies presented in Sections 6.2 through 6.4. The following sections present a summary of the results of the estimation of risk at areas/media of concern at the OFFTA Site.

Receptor risks are presented for each media of concern in the form of tables and summary text. Each of these sections includes summaries of risks estimated by the exposure scenarios. It should be noted that, in each risk summary table where HQs are reported as "N/A", the HQs were not calculable because no RfD has been established. Usually in such cases, carcinogenicity is considered to be more important, since carcinogenicity will generally be seen at lower doses than noncarcinogenic effects. Cancer risks that are reported as "N/A" generally indicate that the chemical is not carcinogenic or that an SF has not yet been developed.

6.5.4 Site-Specific Noncarcinogenic Risks

Site-specific noncarcinogenic risks were estimated for potential receptors at the OFFTA Site. These risks are discussed below and presented on Tables 6-7.1 through 6-7.36 (RAGs D Table 7's).

6.5.4.1 Surface Soil – Noncarcinogenic Risks

RME Risks

Noncarcinogenic risks for surface soil did not exceed a HI of 1.0 for any target organ group. Noncarcinogenic risks are presented for the receptors evaluated, including the residential child (age 1 – 6), residential adult, recreational child (age 1 – 4), recreational pre-adolescent/adolescent (age 5 – 12), recreational adult, and excavation worker (see Tables 6-7.1 through 6-7.12). There are two tables for each receptor, the first for the contribution from ingestion/dermal absorption and the second for the contribution from inhalation of fugitive dust). (Target organ groupings are shown in associated Tables 6-9 as discussed in Section 6.7).

In surface soil, antimony exceeded risk-based screening benchmarks, which are set equal to one-tenth of the RBC. Antimony was not retained for the quantitative risk assessment because concentrations were found to be statistically comparable to background. The potential risk from exposure to this metal is not expected to be significant because the level found was one-third of the RBC, and no other metals contributed to significant non-cancer risks in surface soil.

6.5.4.2 Subsurface Soil - Noncarcinogenic Risks

RME Risks

Noncarcinogenic risks for subsurface soil did not exceed a HI of 1.0 for any target organ group. Noncarcinogenic risks are presented for the receptors evaluated, including the residential child (age 1 - 6), residential adult, and excavation worker (see Tables 6-7.13 through 6-7.18). There are two tables for each receptor, the first for the contribution from ingestion/dermal absorption and the second for the contribution from inhalation of fugitive dust). (Target organ groupings are shown in associated Tables 6-9 as discussed in Section 6.7).

In subsurface soil, cadmium exceeded risk-based screening benchmarks, which are set equal to one-tenth of the RBC. Cadmium was not retained for the quantitative risk assessment because concentrations were found to be statistically comparable to background. The potential risk from exposure to this metal is not expected to be significant because the level found was approximately one-tenth of the RBC, and no other metals contributed to significant non-cancer risks in subsurface soil.

6.5.4.3 Sediment - Noncarcinogenic Risks

RME Risks

Noncarcinogenic risks for sediment did not exceed a HI of 1.0 for any target organ group. Noncarcinogenic risks are presented for the receptors evaluated, including the residential child (age 1 - 6), residential adult, shoreline visitor child (age 1 - 4), and shoreline visitor pre-adolescent/adolescent (age 5 - 12) (see Tables 6-7.19 through 6-7.22, respectively). (Target organ groupings are shown in associated Tables 6-9 as discussed in Section 6.7).

6.5.4.4 Lobster Ingestion - Noncarcinogenic Risks

RME Risks

The estimated RME HI for a subsistence fisherman exposed to lobster collected near the OFFTA Site was 27.2 (Table 6-7.23), which exceeded the acceptable level of 1.0. The target organs exceeding 1.0 and the principal COPCs contributing to noncancer risk were: skin (HI of 11.4 - contributors arsenic and PCBs), CNS (HI of 9.67 - mercury), kidney (HI of 5.0 - contributors cadmium and chromium), and eye (HI of 3.6 - PCBs). (Target organ groupings are shown in associated Tables 6-9 as discussed in Section 6.7).

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the other receptors evaluated, including the recreational child (age 1 - 6) and the recreational adult (see Tables 6-7.24 and 6-7.25, respectively).

CTE Risks

The estimated CTE HI for a subsistence fisherman exposed to lobster collected near the OFFTA Site was 27.2 (Table 6-7.26), which exceeded the acceptable level of 1.0. With CTE risks for lobster ingestion, the target organs associated with HI values exceeding 1.0 and the principal COPCs contributing to noncancer risk are the same as those with RME risk.

6.5.4.5 Clams Ingestion - Noncarcinogenic Risks

RME Risks

The estimated RME HI for a subsistence fisherman exposed to clams collected near the OFFTA Site was 33.3 (Table 6-7.27), which exceeded the acceptable level of 1.0. The target organs exceeding 1.0 and the principal COPCs contributing to noncancer risk were: skin (HI of 15.8 - contributors arsenic and PCBs), CNS (HI of 8.1 - mercury), kidney (HI of 8.9 - contributors cadmium and chromium), and eye (HI of 5.1 - PCBs). (Target organ groupings are shown in associated Tables 6-9 as discussed in Section 6.7).

The estimated RME HI for a recreational child (age 1 - 6) exposed to clams collected near the OFFTA Site was 2.8 (Table 6-7.28), which exceeded the acceptable level of 1.0. One target organ, skin, exhibited a HI greater than 1.0, for which the principal COPCs contributing to noncancer risk were arsenic and PCBs, which yielded total HI of 1.3 for skin.

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the recreational adult (see Tables 6-7.29).

CTE Risks

The estimated CTE HI for a subsistence fisherman exposed to clams collected near the OFFTA Site was 27.7 (Table 6-7.30), which exceeded the acceptable level of 1.0. The target organs exceeding 1.0 and the principal COPCs contributing to noncancer risk were: skin (HI of 15.7 - contributors arsenic and PCBs), CNS (HI of 7.9 - mercury), kidney (HI of 3.4 - contributors cadmium and chromium), and eye (HI of 5.1 - PCBs).

The estimated CTE HI for a recreational child (age 1 - 6) exposed to clams collected near the OFFTA Site was 2.3 (Table 6-7.31), which exceeded the acceptable level of 1.0. One target organ, skin, exhibited a HI greater than 1.0, for which the principal COPCs contributing to noncancer risk were arsenic and PCBs, which yielded total HI of 1.3 for skin.

Noncarcinogenic CTE risks did not exceed a HI of 1.0 for any target organ group for the recreational adult (see Tables 6-7.32).

6.5.4.6 Blue Mussels Ingestion - Noncarcinogenic Risks

RME Risks

The estimated RME HI for a subsistence fisherman exposed to blue mussels collected near the OFFTA Site was 24.5 (Table 6-7.33), which exceeded the acceptable level of 1.0. The target organs exceeding 1.0 and the principal COPCs contributing to noncancer risk were: skin (HI of 8.8 - contributors arsenic and PCBs), CNS (HI of 7.5 - mercury), kidney (HI of 7.9 - contributors cadmium and chromium), and eye (HI of 6.7 - PCBs). (Target organ groupings are shown in associated Tables 6-9 as discussed in Section 6.7).

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the other receptors consuming fish evaluated, including the recreational child (age 1 - 6) and the recreational adult (see Tables 6-7.34 and 6-7.35, respectively).

CTE Risks

The estimated CTE HI for a subsistence fisherman exposed to blue mussels collected near the OFFTA Site was 21.9 (Table 6-7.36), which exceeded the acceptable level of 1.0. The target organs exceeding

1.0 and the principal COPCs contributing to noncancer risk were: skin (HI of 8.8 - contributors arsenic and PCBs), CNS (HI of 7.5 - mercury), kidney (HI of 5.3 - contributors cadmium and chromium), and eye (HI of 6.7 - PCBs).

6.5.5 Site-Specific Cancer Risks

Site-specific cancer nsks were estimated for potential receptors at the OFFTA Site. These risks are discussed below and presented on Tables 6-8.1 through 6-8.49 (RAGs D Table 8's).

6.5.5.1 Surface Soil - Cancer risks

RME Risks

The estimated RME incremental cancer risk (ICR) for a lifetime resident exposed to surface soil at OFFTA Site was 2.5×10^{-5} (see Table 6-8.1 for contribution from ingestion/dermal absorption and Table 6-8.2 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.1×10^{-5}) and 2,3,7,8-TCCD equivalents (ICR = 2.0×10^{-6}), both via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 6.1×10^{-6}) and dibenz(a,h)anthracene (ICR = 4.0×10^{-6}).

The estimated RME ICR for a residential child exposed to surface soil at OFFTA Site was 1.6×10^{-5} (see Table 6-8.3 for contribution from ingestion/dermal absorption and Table 6-8.4 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer nsk were arsenic (ICR = 7.1×10^{-6}) and 2,3,7,8-TCCD equivalents (ICR = 1.3×10^{-6}), both via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 3.9×10^{-6}) and dibenz(a,h)anthracene (ICR = 2.5×10^{-6}).

The estimated RME ICR for a residential adult exposed to surface soil at OFFTA Site was 8.8×10^{-6} (see Table 6-8.5 for contribution from ingestion/dermal absorption and Table 6-8.6 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.6×10^{-6}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 2.3×10^{-6}) and dibenz(a,h)anthracene (ICR = 1.5×10^{-6}).

The estimated RME ICR for a lifetime recreational receptor exposed to surface soil at OFFTA Site was 5.4×10^{-6} (see Table 6-8.7 for contribution from ingestion/dermal absorption and Table 6-8.8 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 2.2×10^{-6}) via ingestion and benzo(a)pyrene (ICR = 1.4×10^{-6}) via ingestion and dermal absorption.

The estimated RME ICR for a recreational child (age 1 - 4) exposed to surface soil at OFFTA Site was 2.4×10^{-6} (see Table 6-8.9 for contribution from ingestion/dermal absorption and Table 6-8.10 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributor to the cancer risk was arsenic (ICR = 1.1×10^{-6}) via ingestion.

The estimated RME ICR for a recreational youth (age 5 - 12) exposed to surface soil at OFFTA Site was 2.0×10^{-6} (see Table 6-8.11 for contribution from ingestion/dermal absorption and Table 6-8.12 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributor to the cancer risk was arsenic (ICR = 7.3×10^{-7}) via ingestion.

The estimated RME ICR for a recreational adult exposed to surface soil at OFFTA Site was less than 1×10^{-6} (see Table 6-8.13 for contribution from ingestion/dermal absorption and Table 6-8.14 for contribution from inhalation of fugitive dust). The ICR was less than EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action.

The estimated RME ICR for an excavation worker exposed to surface soil at OFFTA Site was less than 1×10^{-6} (see Table 6-8.15 for contribution from ingestion/dermal absorption and Table 6-8.16 for contribution from inhalation of fugitive dust). The ICR was less than EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action.

6.5.5.2 Subsurface Soil - Cancer risks

RME Risks

The estimated RME ICR for a lifetime resident exposed to subsurface soil at OFFTA Site was 4.0×10^{-5} (see Table 6-8.17 for contribution from ingestion/dermal absorption and Table 6-8.18 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.7 x 10^{-5}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 1.3 x 10^{-5}), dibenz(a,h)anthracene (ICR = 5.7 x 10^{-6}), benz(a)anthracene (ICR = 1.4 x 10^{-6}), and benzo(b)fluoranthene (ICR = 1.2 x 10^{-6}).

The estimated RME ICR for a residential child exposed to subsurface soil at OFFTA Site was 2.6 x 10^{-5} (see Table 6-8.19 for contribution from ingestion/dermal absorption and Table 6-8.20 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, but slightly greater than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.1 x 10^{-5}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 8.5 x 10^{-6}) and dibenz(a,h)anthracene (ICR = 3.6 x 10^{-6}).

The estimated RME ICR for a residential adult exposed to subsurface soil at OFFTA Site was 1.4 x 10^{-5} (see Table 6-8.21 for contribution from ingestion/dermal absorption and Table 6-8.22 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6} and slightly greater than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 5.7 x 10^{-6}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 4.9 x 10^{-6}) and dibenz(a,h)anthracene (ICR = 2.1 x 10^{-6}).

The estimated RME ICR for an excavation worker exposed to subsurface soil at OFFTA Site was 1.4 x 10^{-6} (see Table 6-8.23 for contribution from ingestion/dermal absorption and Table 6-8.24 for contribution from inhalation of fugitive dust). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6} and less than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributor to the cancer risk was arsenic (ICR = 6.7 x 10^{-7}) via ingestion.

6.5.5.3 Sediment - Cancer risks

RME Risks

The estimated RME ICR for a lifetime resident exposed to sediment at OFFTA Site was 2.2 x 10^{-5} (see Table 6-8.25 for contribution from ingestion/dermal absorption). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, but slightly greater than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 6.1 x 10^{-6}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 1.1 x 10^{-5}), dibenz(a,h)anthracene (ICR = 2.2 x 10^{-6}), and benz(a)anthracene (ICR = 1.4 x 10^{-6}).

The estimated RME ICR for a residential child exposed to sediment at OFFTA Site was 1.2×10^{-5} (see Table 6-8.26 for contribution from ingestion/dermal absorption). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.7×10^{-6}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 5.2×10^{-6}) and dibenz(a,h)anthracene (ICR = 1.1×10^{-6}).

The estimated RME ICR for a residential adult exposed to sediment at OFFTA Site was 1.1×10^{-5} (see Table 6-8.27 for contribution from ingestion/dermal absorption). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 2.4×10^{-6}) via ingestion, and PAHs via ingestion and dermal absorption: benzo(a)pyrene (ICR = 5.3×10^{-6}) and dibenz(a,h)anthracene (ICR = 1.1×10^{-6}).

The estimated RME ICR for a shoreline visitor youth (age 1 - 12) exposed to sediment at OFFTA Site was 1.1×10^{-6} (see Table 6-8.28 for contribution from ingestion/dermal absorption). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.2×10^{-7}) via ingestion and benzo(a)pyrene (ICR = 5.2×10^{-7}) via ingestion and dermal absorption.

The estimated RME ICR for a shoreline visitor child (age 1 - 4) exposed to sediment at OFFTA Site was less than 1×10^{-6} (see Table 6-8.29 for contribution from ingestion/dermal absorption). The ICR was less than EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action.

The estimated RME ICR for a shoreline visitor pre-adolescent/adolescent (age 5 - 12) exposed to sediment at OFFTA Site was less than 1×10^{-6} (see Table 6-8.30 for contribution from ingestion/dermal absorption). The ICR was less than EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action.

6.5.5.4 Lobster Ingestion - Cancer risks

RME Risks

The estimated RME ICR for a subsistence fisherman exposed to lobster at OFFTA Site was 1.4×10^{-3} (see Table 6-8.31). The ICR was at the upper end of EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.2×10^{-3}), PCBs (ICR = 5.0×10^{-5}), dieldrin (6.7×10^{-6}), and PAHs: benzo(a)pyrene (ICR = 1.2×10^{-4}) and benzo(b)fluoranthene (ICR = 1.3×10^{-5}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a lifetime recreational receptor exposed to lobster at OFFTA Site was 1.1×10^{-4} (see Table 6-8.32). The ICR was at the upper end of EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the $1 \text{ X } 10^{-5}$ ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 9.7×10^{-5}), PCBs (ICR = 4.0×10^{-6}), and PAHs: benzo(a)pyrene (ICR = 9.5×10^{-6}) and benzo(b)fluoranthene (ICR = 1.0×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a recreational child (age 1 - 6) exposed to lobster at OFFTA Site was 2.9×10^{-5} (see Table 6-8.33). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the $1 \text{ X } 10^{-5}$ ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 2.5×10^{-5}), PCBs (ICR = 1.0×10^{-6}), and benzo(a)pyrene (ICR = 2.5×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a recreational adult exposed to lobster at OFFTA Site was 8.5×10^{-5} (see Table 6-8.34). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but greater than the $1 \text{ X } 10^{-5}$ ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 7.2×10^{-5}), PCBs (ICR = 3.0×10^{-6}), and benzo(a)pyrene (ICR = 7.1×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

CTE Risks

The estimated CTE ICR for a subsistence fisherman exposed to lobster at OFFTA Site was 5.3×10^{-4} (see Table 6-8.35). The ICR exceeded EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the $1 \text{ X } 10^{-5}$ ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 4.5×10^{-4}), PCBs (ICR = 1.9×10^{-5}), dieldrin (2.5×10^{-6}), and PAHs: benzo(a)pyrene (ICR = 4.4×10^{-5}) and benzo(b)fluoranthene (ICR = 4.8×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated CTE ICR for a lifetime recreational receptor exposed to lobster at OFFTA Site was 4.2 x 10^{-5} (see Table 6-8.36). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.6 x 10^{-5}), PCBs (ICR = 1.5 x 10^{-6}), and benzo(a)pyrene (ICR = 3.5 x 10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

6.5.5.5 Clams Ingestion - Cancer risks

RME Risks

The estimated RME ICR for a subsistence fisherman exposed to clams at OFFTA Site was 1.7 x 10^{-3} (see Table 6-8.37). The ICR slightly exceeded EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.6 x 10^{-3}), PCBs (ICR = 7.0 x 10^{-5}), dieldrin (5.4 x 10^{-6}), and PAHs: benzo(a)pyrene (ICR = 6.5 x 10^{-6}), benzo(b)fluoranthene (ICR = 1.0 x 10^{-6}), and benzo(a)anthracene (ICR = 1.0 x 10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a lifetime recreational receptor exposed to clams at OFFTA Site was 1.4 x 10^{-4} (see Table 6-8.38). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.3 x 10^{-4}) and PCBs (ICR = 5.7 x 10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a recreational child (age 1 - 6) exposed to clams at OFFTA Site was 3.6 x 10^{-5} (see Table 6-8.39). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, but slightly greater than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.4 x 10^{-5}) and PCBs (ICR = 1.5 x 10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a recreational adult exposed to clams at OFFTA Site was 1.0 x 10^{-4} (see Table 6-8.40). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, but greater than the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 9.8 x 10^{-5}) and PCBs (ICR = 4.2 x 10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

CTE Risks

The estimated CTE ICR for a subsistence fisherman exposed to clams at OFFTA Site was 6.5×10^{-4} (see Table 6-8.41). The ICR exceeded EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 6.1×10^{-4}), PCBs (ICR = 2.6×10^{-5}), dieldrin (2.0×10^{-6}), benzo(a)pyrene (ICR = 2.4×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated CTE ICR for a lifetime recreational receptor exposed to clams at OFFTA Site was 5.1×10^{-5} (see Table 6-8.42). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 4.8×10^{-5}) and PCBs (ICR = 2.1×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated CTE ICR for a recreational child (age 1 - 6) exposed to clams at OFFTA Site was 1.2×10^{-5} (see Table 6-8.43). The ICR was at the upper end of EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributor to the cancer risk was arsenic (ICR = 1.1×10^{-5}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated CTE ICR for a recreational adult exposed to clams at OFFTA Site was 3.9×10^{-5} (see Table 6-8.44). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.7×10^{-5}) and PCBs (ICR = 1.6×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

6.5.5.6 Blue Mussels Ingestion - Cancer Risks

RME Risks

The estimated RME ICR for a subsistence fisherman exposed to blue mussels at OFFTA Site was 4.4×10^{-4} (see Table 6-8.45). The ICR was greater than EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 3.2×10^{-4}), PCBs (ICR = 9.2×10^{-5}), dieldrin (8.7×10^{-6}), and PAHs: benzo(a)pyrene (ICR = 6.6×10^{-6}), benzo(b)fluoranthene (ICR = 1.3×10^{-6}), benzo(a)anthracene (ICR = 1.1×10^{-6}), and dibenzo(a,h)anthracene (ICR = 1.1×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a lifetime recreational receptor exposed to blue mussels at OFFTA Site was 3.5×10^{-5} (see Table 6-8.46). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and exceeded the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 2.6×10^{-5}) and PCBs (ICR = 7.5×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a recreational child (age 1 - 6) exposed to blue mussels at OFFTA Site was 9.1×10^{-6} (see Table 6-8.47). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6} and less than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 6.7×10^{-6}) and PCBs (ICR = 1.9×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

The estimated RME ICR for a recreational adult exposed to blue mussels at OFFTA Site was 2.6×10^{-5} (see Table 6-8.48). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.9×10^{-5}) and PCBs (ICR = 5.6×10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

CTE Risks

The estimated CTE ICR for a subsistence fisherman exposed to blue mussels at OFFTA Site was 1.6 x 10^{-4} (see Table 6-8.49). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. The primary contributors to the cancer risk were arsenic (ICR = 1.2 x 10^{-4}), PCBs (ICR = 3.5 x 10^{-5}), dieldrin (3.3 x 10^{-6}), benzo(a)pyrene (ICR = 2.5 x 10^{-6}). However, the cancer risk from arsenic, the primary risk driver, may be overestimated (see the risk uncertainty discussion in Section 6.7).

6.5.6 Blood-Lead Risk Characterization

Blood-lead levels resulting from soil or sediment exposure in residential children (age 1 - 6) and from fish tissue ingestion in recreational children (age 1 - 6) were estimated using the Integrated Exposure and Uptake Biokinetic (IEUBK) Model (version 0.99) developed by EPA (EPA, 1994b). The model is applied using the soil, sediment, or fish tissue EPCs in each applicable medium of concern where lead was selected as a COPC at the OFFTA Site (See Site Specific RME and CTE EPC tables for specific lead values).

The output of the IEUBK Model is a histogram that presents the estimated percentage of children with a blood-lead level above 10 ug/dL (considered to be the threshold significance level above which adverse effects cannot be ruled out). When the percentage of the population estimated to have blood-levels above 10 ug/dL is greater than five percent, then EPA considers the potential for adverse effects to be significant (EPA, 1994a). These histograms, along with input information particular to each run of the IEUBK model, are presented in Appendix Q-6. Uncertainties associated with the IEUBK model are discussed in Section 6.6.

For the assessment of lead in shellfish consumed by recreational children and lead in surface soil, subsurface soil, and sediment ingested by residential children, default values in the model are used to represent background lead concentrations in air, house dust, water, and the level of maternal contribution. Additionally, the model's default values are used to represent respiratory rate, soil and water ingestion rates, and the percent of lead absorption by the various exposure routes. The only site-specific factor put into the IEUBK model is the concentration of lead (EPC) in each medium of interest.

Noncarcinogenic risks for subsistence fishermen from exposures to lead in lobster, clams, and blue mussels were estimated using the Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil (EPA, 1996). The intake assumptions used in the model are the lead concentrations (EPCs) in shellfish at the site, the shellfish ingestion rate, and an exposure frequency.

6.5.6.1 Exposure to Lead in Surface Soil

Lead was selected as a COPC in surface soil. The estimated percentage of children exposed to surface soil that are predicted to exhibit a blood lead level above 10 ug/dL is 0.03 percent (Appendix Q). This is below EPA's protective level cutoff of 5 percent. This indicates that lead exposure to residential children under these conditions will not result in adverse effects.

6.5.6.2 Exposure to Lead in Subsurface Soil

Lead was selected as a COPC in subsurface soil. The estimated percentage of children exposed to subsurface soil that are predicted to exhibit a blood lead level above 10 ug/dL is 18.6 percent (Appendix Q). This exceeds EPA's protective level cutoff of 5 percent and indicates that adverse effects cannot be ruled out from lead exposure to residential children under these conditions.

6.5.6.3 Exposure to Lead in Sediment

Lead was not selected as a COPC in sediment because concentrations were below the RBC.

6.5.6.4 Exposure to Lead in Lobster

Lead was selected as a COPC in lobster. The estimated percentage of children exposed to lead from consumption of lobster obtained during recreational fishing that are predicted to exhibit a blood lead level above 10 ug/dL is 55.5 percent (Appendix Q). This exceeds EPA's protective level cutoff of 5 percent and indicates that adverse effects cannot be ruled out from lead exposure to children under these conditions.

A lead concentration of 15.9 mg/kg in lobster is associated with a 95 percent fetal blood lead value of 40.2 ug/dL for a pregnant adult whose dietary intake includes daily consumption of lobster obtained from subsistence fishing. This exceeds EPA's protective level cutoff of 10 ug/dL and indicates that adverse effects cannot be ruled out from lead exposure to the fetus under these conditions.

6.5.6.5 Exposure to Lead in Clams

Lead was selected as a COPC in clams. The estimated percentage of children exposed to lead from consumption of clams obtained during recreational fishing that are predicted to exhibit a blood lead level above 10 ug/dL is 16.5 percent (Appendix Q). This exceeds EPA's protective level cutoff of 5 percent and indicates that adverse effects cannot be ruled out from lead exposure to children under these conditions.

A lead concentration of 5.45 mg/kg in clams is associated with a 95 percent fetal blood lead value of 16.4 ug/dL for a pregnant adult whose dietary intake includes daily consumption of clams obtained from subsistence fishing. This exceeds EPA's protective level cutoff of 10 ug/dL and indicates that adverse effects cannot be ruled out from lead exposure to the fetus under these conditions.

6.5.6.6 Exposure to Lead in Blue Mussels

Lead was selected as a COPC in blue mussels. The estimated percentage of children exposed to lead from consumption of blue mussels obtained during recreational fishing that are predicted to exhibit a blood lead level above 10 ug/dL is 13.6 percent (Appendix Q). This exceeds EPA's protective level cutoff of 5 percent and indicates that adverse effects cannot be ruled out from lead exposure to children under these conditions.

A lead concentration of 4.62 mg/kg in blue mussels is associated with a 95 percent fetal blood lead value of 14.5 ug/dL for a pregnant adult whose dietary intake includes daily consumption of blue mussels obtained from subsistence fishing. This exceeds EPA's protective level cutoff of 10 ug/dL and indicates that adverse effects cannot be ruled out from lead exposure to the fetus under these conditions.

6.6 UNCERTAINTY ANALYSIS

The goal of the uncertainty analysis is to identify important uncertainties and limitations associated with the BLRA. Uncertainties are related to each component of the assessment (i.e., data collection/evaluation, exposure assessment, toxicity assessment, and risk characterization). The effect of a particular uncertainty on the outcome of the assessment (i.e., risk estimates) is also indicated, where possible.

As discussed in EPA (1989a), the risk measures used in Superfund site risk assessments are not fully probabilistic estimates of risk but rather are conditional estimates based on a considerable number of assumptions about exposure and toxicity. There are uncertainties associated with each aspect of risk assessment, from environmental data collection through risk characterization. To support decision-making processes, significant uncertainties in the risk assessment for the OFFTA Site are noted in the following sections.

6.6.1 Uncertainties Associated with Data Collection/Evaluation

Major uncertainties associated with data collection/evaluation are highlighted below.

6.6.1.1 Selection of L cations and Numbers of Samples

The areal extent of the samples (including the number collected and location of the sampling points) in a particular area/media of interest impacts the selection of COPCs, the calculation of EPCs, and consequently the risks estimated for a site. Generally, sample collection at each area of interest/site should reflect actual site conditions and should include areas that contain the most significant contamination or exposure problems. At the OFFTA Site, the distribution of sampling locations in several media of interest greatly added to the uncertainty regarding whether the sampling results reflect actual site conditions. Generally, very few samples were collected in the shoreline sediment medium. These problems affect whether the data set is considered representative of potential site conditions for exposed receptors and impact the uncertainty for COPC selection, EPC calculation, and Risk Estimation, as discussed in the following paragraphs.

6.6.1.2 Data Collection Impacts on Selection of COPCs

Too few samples collected in an area/medium of interest can impact the selection of COPCs if sampling coverage missed the areas of highest contamination, causing COPCs to be eliminated that are actually significant contaminants at the site.

Background surface soil and subsurface soil samples were collected in adequate quantity (approximately 16 or 17 samples of each medium) to be considered usable for statistical comparisons in the risk assessment analysis. Therefore, comparisons of background concentrations to concentrations in samples associated with the site were used to eliminate surface soil and subsurface soil COPCs from risk characterization tables. Because of the adequate size of the data sets, the decisions made using statistical tests should have the power to detect small differences between site data and background data populations, with less than a five percent chance of false positives (i.e., concluding that the site population is greater than background when in fact this is not the case.) The background comparison tables presented in Appendix Q show that some site concentrations of inorganics are not greater than background.

In accordance with U.S. Navy policy, the elimination of COPCs is appropriate on the basis of comparison to background as was done for surface and subsurface soil. However, EPA Region I risk assessment guidance does not allow for the elimination of chemicals as COPCs on the basis of background. The net impact of this difference between EPA and Navy procedures on the risk assessment was that one substance in surface soil, antimony, and one substance in subsurface soil, cadmium, exceeded risk-based screening benchmarks but were not retained for the quantitative risk assessment because concentrations were found to be statistically comparable to background. The potential risk from exposure to antimony is not expected to be significant because the level found was one-third of the RBC, and no other metals contributed to significant non-cancer risks in surface soil. Similarly, the potential risk from exposure to cadmium is not expected to be significant because the level found was approximately one-tenth of the RBC, and no other metals contributed to significant non-cancer risks in subsurface soil.

A problem associated with the use of background data for fish tissue samples is that only one or two background samples were available for each species. Consequently, statistical comparisons were not used to eliminate COPCs because under these circumstances background data may not be entirely representative. The elimination of COPCs present in background samples would have resulted in lowered risk estimates. Because the range of concentrations for the risk drivers arsenic, PCBs, and PAHs in background fish samples was very similar to that found in site-associated samples, inclusion of these chemicals as COPCs is likely to have significantly overestimated the risks attributable to the site.
In addition, too few site-related sediment samples were collected to perform meaningful statistical background comparison tests, which precluded using background comparisons to eliminate COPCs in this medium. The collection of additional site-related samples might have been able to demonstrate that site-related concentrations of some inorganics are not elevated above background.

6.6.1.3 Data Collection Impacts on EPCs and Risks

Collecting only a very limited number of samples within an area/medium of interest can impact the calculation of EPCs. First, the limited number of samples collected in an area/medium of interest may cause the maximum to be selected instead of the 95 percent UCL as the EPC because of fewer degrees of freedom and higher uncertainty in the H-value or t-value used to generate the 95 percent UCL. In such cases, a more representative number could have been determined if additional samples had been taken. In addition, when limited samples are collected at an area/medium of interest, sampling coverage may have missed the areas of highest contamination, which would cause the EPC to be biased low.

6.6.1.4 Data Collection Impacts on Risks

An uncertainty associated with data collection at the OFFTA Site is associated with the impacts of sampling coverage and bias on risk estimation. The risk estimation is generally proportional to the calculated EPCs; therefore, EPC and risk estimation uncertainties are interrelated such that uncertainties in EPCs that are considered high, will greatly affect the risks, and vice versa.

6.6.1.5 Uncertainties Regarding the Selection of the EPC

Other uncertainties exist regarding selection of a concentration for input into the quantitative risk assessment. The use of the exposure point concentration to estimate risk is generally regarded as a conservative estimate since this entails using either the upper 95 percent confidence limit on the arithmetic mean (based on normal or log-transformed data distribution) or the maximum concentration. The choice of the exposure point concentration as the value for input into the risk assessment generally lowers the chances of under estimation of the actual risk present in a pathway at a particular area of interest to a potential receptor. However, the use of the exposure point concentration may overestimate the actual risk present in an exposure pathway at a particular area of interest. To help avoid this problem, the maximum value was used in place of the upper 95 percent confidence limit when the latter was larger.

The ability (power) of the W test to be able to correctly identify genuine differences between the shape of a sample population versus a reference normal or lognormal population is reduced when too few samples are collected. If an incorrect distributional assumption is made based on this test, this could lead to an over- or underestimate of the upper 95 percent concentration, which in turn would create some additional uncertainty as to whether the calculated risk is a reasonable approximation of high end exposure. To help avoid potentially overestimating risk, the maximum value was used in place of the upper 95 percent limit when the latter was larger.

6.6.1.6 Uncertainties in Laboratory Data Quality

Established data validation procedures were applied to define analytical uncertainties in terms of qualifying data as inaccurate or imprecise and to eliminate data points that are unusable for risk assessment. This treatment does not eliminate all uncertainty but focuses attention on potential areas of concern regarding accuracy, precision, and data gaps. Validation was conducted by the Navy contractors (TRC - Phases I and II, TtNUS - Phase III) using EPA Region I and National Guidance.

6.6.1.7 Uncertainties in Analytical Database Usability

The chemical analytical database has some limitations regarding the representativeness of the laboratory results, the inclusion of nondetected data, data gaps, number of samples collected, and heterogeneity of sample data. The effects of these limitations on the results of the risk assessment are varied. However, every effort was made to collect and use samples that reflect actual site conditions. These actions should minimize uncertainty in the database.

6.6.1.8 Uncertainties in Risk-Based Screening Levels

The use of single-route (ingestion) risk-based screening concentrations may lead to the underestimation of risks since these values do not account for the additive effects across various exposure pathways. However, the resultant effects on risks is not expected to be significant because conservative values, derived from a target Hazard Index of 0.1 for noncarcinogens and a target risk of 1 x 10^{-6} for carcinogens were employed.

In general, the use of soil screening levels for sediment exposure is regarded as a conservative approach to COPC selection because sediment exposure at the site is expected to be significantly less than soil exposures that are the basis of the soil screening levels.

6.6.2 Uncertainties Associated with Exposure Assessment

This section identifies and quantifies, to the extent possible, the uncertainties associated with the exposure assessment for the site. The potential areas of uncertainty include the selection of current and anticipated future land uses, selection of exposure pathways, calculation and modeling of EPCs, and the selection of specific receptors and exposure parameters.

The likelihood of the occurrence of the defined exposure scenarios is not always known. Identified land use and activity patterns at a site are limited to the observations made during the field investigation, known land uses in the surrounding area, and information provided by the Navy on past land use.

Uncertainty exists in the subsurface soil exposure scenario because there is a low likelihood that residential receptors would be continually exposed to subsurface soil that has been uncovered and re-distributed at the surface of the ground. It is more probable that a construction operation would redistribute only a small fraction of subsurface soil at the ground surface, and in which case subsurface soils would have been mixed and diluted with surface soil, rather than displacing entirely all of the former surface soil. Therefore, the EPCs and risks for subsurface soil exposure to future residents may be biased high for substances such as arsenic, which were found at lower levels in surface soil than in subsurface soil.

This BLRA considers potential risks associated with future shellfish ingestion. However, there is currently a ban on shell fishing in portions of Narragansett Bay as a result of the proximity of the Newport treatment plant. Therefore, shell fishing may represent an exposure that is unlikely to occur in the near future. Three receptors (future recreational child, future recreational adult, and future subsistence fisherman) were considered. Compared to recreational fishing, subsistence fishing is uncommon and has not been observed at the OFFTA Site. The hypothetical subsistence fisherman was utilized to represent a worst case for assessing the need to protect human health from future ingestion of contaminants in shellfish.

Of the input parameters used for these receptors, the shellfish ingestion rate is associated with the greatest degree of uncertainty. The recreational adult ingestion value of 1200 mg/day is based on an estimated seafood serving size of 150,000 mg/meal and Rhode Island survey information of the typical number of hard-shell clam (quahog) meals per year (2.9 meals/year) [both values provided by RIDEM in the Narragansett Bay Project (n.d.)]. The resulting clam ingestion rate of 1,200 mg/day is three times higher than the clam ingestion rate of 442 mg/day presented by EPA (1990a), which suggests that the ingestion rate used in this risk assessment might be biased high by as much as a factor of three. The EPA (1990a) value is based on a month-long survey that requested consumer information on the type and amount of fish consumed and is believed to represent 94 percent of the general population (see EPA, 1990a). In the absence of information on mussel and lobster ingestion rates, the Narragansett Bay Project value for clams is used. The child shellfish ingestion value of 396 mg/day was derived from the adult value as a percentage of the adult meal size and for this reason may also be biased high.

There are limitations to using various models and/or equations to estimate exposure doses or contaminant concentrations. For example, modeled concentrations (i.e., generated fugitive dust concentrations) may not be indicative of actual site conditions during exposure.

Exposure to fugitive dust conservatively assumes that potential receptors will be exposed to the same concentration indoors as outdoors (a very conservative assumption), that only 50 percent of land surface area is covered by vegetation, that soils within an area have unlimited erosion potential, that emissions can be estimated from mean annual windspeed and vegetative cover, and that dispersion concentrations can be estimated from source area, downwind distance to receptors, and region-wide meteorological factors. These uncertainties were partially offset by the calculation of a site-specific particulate emission factor (PEF) using defined site characteristics and assumptions provided in EPA's Soil Screening Guidance (EPA, 1996c). The effect of the uncertainties using the fugitive dust model is expected to be low based on the fact that carcinogenic and noncarcinogenic risks for the inhalation pathway were several orders of magnitude less than risks due to exposure via the ingestion and dermal absorption pathways.

The model for dermal exposure to soil and sediment assumes that only a very thin, constant thickness layer of soil is available for contaminant transfer to the stratum corneum and that a constant amount of contaminant, proportional to the soil concentration, will be absorbed per unit area of skin and per exposure event. However, adherence to skin varies with such factors as particle size, soil type, and organic carbon content. As estimated by EPA (1992e), the absorbed dermal dose could vary by as much as a factor of 50 from the model estimates, even assuming that activity patterns lead to the exposure duration applied in the experimental trials used to develop absorption factors.

Prediction of absorption rates for lipophilic compounds is difficult due to, among other reasons, the possibility of a second absorption pathway that depends on the lipid content of the stratum corneum at the application site. Experimental determination of absorption rates indicates that interspecies differences are considerable, which, along with other variability's related to condition and age of skin, differences in lag time, and site of application effects, yields appreciable uncertainty in estimated dermal exposures by using published chemical-specific permeation functions. In addition, literature data indicate a variation by as much as a factor of 300 in chemical absorption rates for skin in different anatomical areas of the body. It should also be noted that children generally have greater absorption rates than adults.

Exposure assumptions can add uncertainty into the risk assessment process based on input values selected for each exposure route. The rationale for each assumption was provided in each table of input parameters. Receptor characteristics, such as age and skin surface areas, were based on published values. Conservative values (based on reasonable maximum exposure data or professional judgment) were used in most exposure equations, except where average values are expected to better correspond to actual site conditions.

6.6.3 Uncertainties Associated With Toxicity Assessment

6.6.3.1 RfDs and SFs

There is uncertainty associated with the RfDs and SFs. The uncertainty results from the extrapolation of animal data to humans, the extrapolation of carcinogenic effects from the laboratory high-dose to the environmental low-dose scenarios, and interspecies and intraspecies variations in toxicological endpoints caused by chemical exposure. The use of EPA RfD values is generally considered to be conservative because the doses are based on no-effect or lowest-observed-effect levels and then further reduced with uncertainty factors to increase the margin of safety by a factor in the neighborhood of 10 to 1,000-fold.

The RfDs and SFs of some chemicals have not been established, and therefore toxicity could not be quantitatively assessed. In most cases, where RfDs were unavailable for carcinogens, the carcinogenic risk is considered to be much more significant since carcinogenic effects usually occur at much lower doses.

The uncertainty associated with the dermal exposure is high because of the derivation of the dermal slope factor and reference dose. The dermal toxicity factors are based on default oral absorption factors. This can result in an overestimation of the toxicity factors. In general, dermal exposures at OFFTA Site did not drive the carcinogenic or noncarcinogenic risks, therefore, the effects of this uncertainty are expected to be minimal.

As discussed in Section 6.6.4.2, established RfDs have an inherent amount of uncertainty. Uncertainty factors for RfDs used in this BHRA are presented on Tables 6-5.1 and 6-5.2. Some chemical specific uncertainties should be noted as follows:

Although the accepted basis for evaluating risk associated with exposure to arsenic is to assume it is a carcinogen, there is uncertainty whether carcinogenic effects are the primary health effects expected to be manifested upon exposure to arsenic. There is some scientific information to indicate that humans are capable of metabolizing arsenic to expedite its elimination from the body (ATSDR, 1988). [Specifically, the body methylates the arsenic to form monomethyl arsenic and dimethyl arsenic]. There is a limited capacity for the body to metabolize methylate arsenic, but this limit is generally reached when the body's intake of arsenic approximately exceeds 500 µg/day. Generally, concentrations of arsenic at the areas/media of interest at OFFTA Site would be expected to correspond to levels that are well within the body's ability to metabolize arsenic. On the other hand, arsenic has been associated with a variety of cancers in epidemiological studies. This adds to the uncertainty regarding carcinogenic risks associated with arsenic exposure.

Arsenic risks in fish were based on EPA's oral slope factor, which in turn is based on studies performed using arsenic trioxide. However, arsenic in seafood exists in an organic state known as arsenobetaine. Approximately 80 to 90 percent of the arsenic available in seafood is in the organic form, which is not toxic (taken from Guidance Document for Arsenic in Shellfish, USFDA, January, 1993). Therefore, the levels of risk estimated for arsenic in seafood at the OFFTA site are overestimates by as much as a factor of 10 because they are not based on toxicity values for arsenobetaine, but rather on inorganic arsenic, which has been demonstrated to be much more toxic than arsenobetaine.

In nature, chromium (III) predominates over chromium (VI) (Langård and Norseth 1986). Little chromium (VI) exists in biological materials, except shortly after exposure, because reduction to chromium (III) occurs rapidly. Toxicity criteria are available for two different forms of chromium, the trivalent state and the hexavalent state; the latter is considered to be more toxic. No chromium speciation was performed at the OFFTA Site, therefore, it was conservatively assumed that chromium is present in the hexavalent form. This could tend to overestimate the noncarcinogenic risks at the site.

Quantitative risks were not calculated for aluminum, cobalt, copper, and iron because these metals do not have accepted toxicity values for use in quantitative risk assessment. With few exceptions, their concentrations in soil, surface water, sediment, and fish tissue at the OFFTA Site do not exceed risk-based screening criteria [derived from provisional RfDs developed by the EPA National Center for Environmental Assessment (NCEA)] as listed in the EPA Region 3 risk-based concentration table. Copper exceeded the RBC for fish tissue in lobster samples and iron exceeded the RBC for soil, sediment, and fish tissue. However, under all exposure scenarios, the daily intakes of these metals from consumption of shellfish do not exceed the upper range of adult and child recommended dietary allowances (RDA) of 10 mg/day for iron and 2 mg/day for copper. At the OFFTA Site, exposure intakes of iron would exceed the RDA for adults and children exposed to surface or subsurface soil, but not by more than a factor of four. In human metabolism, iron uptake is known to be closely regulated by homeostatic mechanisms. Therefore, the uncertainty from lack of toxicity factors for aluminum, cobalt, copper, and iron is not expected to result in underestimation of potential human health risks at the OFFTA Site.

Seven potential organic COPCs; 3-Chloro-4-methylphenol, 4,6-dinitro-2-methylphenol, delta-BHC, and the PAHs acenaphthylene, benzo(g,h,i)perylene, phenanthrene, 1-methylphenanthrene, 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, benzo(e)pyrene, and perylene did not have listed toxicity values for use in the quantitative risk assessment; therefore, no risks were estimated for exposure to these chemicals.

- 3-Chloro-4-methylphenol is selected as a COPC in surface soil. 3-Chloro-4-methylphenol was present at a maximum of 140 ug/kg in 3/71 surface soil samples. The exclusion of 3-chloro-4-methylphenol could potentially underestimate the noncarcinogenic or carcinogenic risk at OFFTA. However, due to its low frequency of detection and low concentration, the exclusion of 3-chloro-4-methylphenol is not expected to have a significant impact on the surface soil risks.

- 4,6-Dinitro-2-methylphenol is selected as a COPC in subsurface soil. 4,6-Dinitro-2-methylphenol was present at a maximum of 320 ug/kg in 1/29 subsurface soil samples. The exclusion of 4,6-Dinitro-2-methylphenol could potentially underestimate the noncarcinogenic or carcinogenic risk at OFFTA. However, due to its low frequency of detection and low concentration, the exclusion of 4,6-Dinitro-2-methylphenol is not expected to have a significant impact on the subsurface soil risks.

- Delta-BHC was not selected as a COPC in subsurface soil because of lack of an established risk-based screening criterion, cancer slope factor, and noncancer RfD. Delta-BHC was present at a maximum of 2.4 ug/kg in 1/33 subsurface soil samples. The exclusion of delta-BHC could potentially underestimate the noncarcinogenic or carcinogenic risk at THE OFFTA Site.

However, due to its low frequency of detection and low concentration, the exclusion of delta-BHC is not expected to have a significant impact on the subsurface soil risks. Also, examination of the cancer slope factors of related compounds (alpha, beta, and gamma-BHC) indicates that other chemicals in this family exhibit cancer slope factors or noncancer toxicity associated with screening levels ranging from 100 ug/kg to 490 ug/kg, which are considerably greater than the 2.4 ug/kg maximum detected concentration of delta-BHC.

- Acenaphthylene, benzo(g,h,i)perylene, and phenanthrene were detected in surface soil, subsurface soil, and/or sediment. Although RfDs were not available for these substances, surrogate screening values were adopted using other PAH compounds with published RfD values. These substances were found to be present at levels that are orders of magnitude below screening levels and so these substances were not selected as COPCs. Therefore, the potential for underestimating risks as a result of excluding these chemicals is believed to be low.

- The PAHs 1-Methylphenanthrene, 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, benzo(e)pyrene, and perylene were selected as COPCs in lobster, clams, and blue mussels. 1-Methylphenanthrene, 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, and perylene were found at low levels in all 3 species of shellfish (generally from 1 to 20 ug/kg), while the levels of benzo(e)pyrene ranged from 2 to 300 ug/kg. Because their detected levels were low relative to other PAHs, the exclusion of 1-methylphenanthrene, 2,3,5-trimethylnaphthalene, 2,6-dimethylnaphthalene, and perylene is not likely to have significantly underestimated risks. The exclusion of benzo(e)pyrene could potentially underestimate the carcinogenic risk from shellfish consumption, since this substance was present at concentrations as high as other carcinogenic risk drivers in lobster, clams and blue mussels. However, noncarcinogenic risks in shellfish are not as likely to be biased because all PAHs present in shellfish were found at levels orders of magnitude below applicable RBCs that were derived from noncarcinogenic toxicity factors.

6.6.4 Uncertainties Associated With Risk Characterization

The constituents contributing the most to the shellfish ingestion cancer risks are arsenic, PCBs, and PAHs. However, the majority of these risks may not be related to contamination originating from OFFTA because the detected ranges of these substances were similar between background reference samples and samples associated with the site. A quantitative comparison of site versus background data was not possible for shellfish because too few background shellfish samples were collected to allow a representative and confident statistical evaluation. The close similarity in concentrations between site and background shellfish are shown for lobster, clams, and blue mussels in Appendix Q, Tables Q-15, Q-16, and Q-17, respectively. Maximum arsenic and PCB concentrations were very similar between site and background in lobster and blue mussels, while the maximum levels in clams were about an order of magnitude greater in clams collected near the site than in background samples. Site and background PAH concentrations were similar in clams and blue mussels, while the maximum levels of PAHs in lobster were notably greater in samples collected near the site than in background samples.

Arsenic was the constituent contributing the most to the surface soil and subsurface soil cancer risks. Arsenic was retained as a COPC because levels were statistically elevated above background in surface soil and subsurface soil. However, the data suggest an across the board trend of mildly elevated levels across the whole data set and not a marked difference in the number of arsenic hot spots or their upper concentrations. The Upper Ranks Test indicates that more than half of the arsenic results in the site data set were slightly higher in concentration when ranked alongside the arsenic background samples.

Site-related risks from arsenic in subsurface soil are estimated to be less than background-related risks from arsenic in subsurface soil. This is because the arsenic RME EPC in subsurface soil is 10.1 mg/kg, which is less than the EPC for arsenic in background subsurface soil (26.1 mg/kg). In this case, the EPC concentration tends to be influenced more by the upper range of concentrations in a data set than by the average levels, and therefore, RME cancer risks would be greater in the background soil data set than in the site data set. This was not the case for surface soil, where the EPC for background data (3.98 mg/kg) was slightly less than the EPC for site data (6.36 mg/kg).

ICRs and HIs are summed for all potential COPCs and for all applicable routes of exposure. Summing the risks implies that no antagonistic or synergistic effects exist between chemicals. It also assumes that similar mechanisms of action and metabolism are prevalent. Therefore, the use of this approach may either underestimate or overestimate the risks, depending on the chemical-specific interactions, which cannot be predicted. The direction of the uncertainty cannot be defined, but the methodology used is based on current EPA guidance.

Risks to any individual may also be overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may be exposed via all pathways considered.

The IEUBK model accounts for the multimedia nature of lead exposure, incorporates absorption and pharmacokinetic information, and allows the risk manager to consider the potential distributions of exposure and risk likely to occur at a site (the model goes beyond providing a single point estimate output). Although uncertainties are associated with blood lead modeling using the IEUBK model, these uncertainties are considered lower than those that conceivably would result from similar lead evaluations performed using a traditional toxicity slope-based approach. Important uncertainties and limitations in the use of the IEUBK model are listed below.

The IEUBK model uses a default of 30 percent lead absorption from soil. However, the bioavailability of lead from different sources may be variable due to differences in lead speciation, particle size, and mineral matrix and may also vary as a function of physiological parameters such as age, nutritional status, gastric pH, and transit time. For example, lead absorption from paint chips in soil may be different than lead absorption from other chemical forms.

Blood lead variability in the IEUBK model is characterized by a single number, the geometric standard deviation, which is set to a default value of 1.6. This value represents the aggregate uncertainty in all sources of population variability, including biological, uptake, exposure, sampling, and analytical components.

Child blood lead level predictions obtained using the IEUBK model reflect only the contributions of sources entered into the model and do not take into account any existing body burden that may be the result of prior exposures or any exposures that may have taken place at alternate locations away from the household or neighborhood level, such as parks or daycare centers.

6.7 SUMMARY OF THE BLRA FOR OFFTA SITE

The following items summarize the BLRA for OFFTA Site.

The media of interest for the BLRA at OFFTA Site were surface soil, subsurface soil, sediment, and shellfish (lobster, clams, and blue mussels).

The BLRA for the OFFTA Site considered potential exposures to residents (future exposures to children, age 1 - 6, and adults), recreational receptors (current/future exposures to children, age 1 - 4, pre-adolescent/adolescent youth, age 5 - 12, and adults), shoreline visitors (current/future exposures exposures to children, age 1 - 4 and pre-adolescent/adolescent youth, age 5 - 12), and excavation workers (future exposures).

6.7.1 Surface Soil

The estimated RME incremental cancer risk (ICR) for a lifetime resident exposed to surface soil was 2.5×10^{-5} (see Table 6-9.1). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM. Noncarcinogenic risks for the residential child (age 1 - 6) and residential adult did not exceed a HI of 1 for any target organ group (Tables 6-9.2 and 6-9.3).

The estimated RME ICR for a lifetime recreational receptor exposed to surface soil was 5.4×10^{-6} (see Table 6-9.4). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and less than the 1×10^{-5} ICR benchmark used by RIDEM. Noncarcinogenic risks for the recreational child (age 1 - 4), recreational preadolescent/adolescent (age 5 - 12), and recreational adult did not exceed a HI of 1 for any target organ group (Tables 6-9.5, 6-9.6, and 6-9.7).

The estimated RME ICR for an excavation worker exposed to surface soil was less than 1×10^{-6} (see Table 6-9.8). The ICR was less than EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and less than the 1×10^{-5} ICR benchmark used by RIDEM. Noncarcinogenic risks did not exceed a HI of 1 for any target organ group.

6.7.2 Subsurface Soil

The estimated RME incremental cancer risk (ICR) for a lifetime resident exposed to subsurface soil was 4.0×10^{-5} (see Table 6-9.9). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5} ICR benchmark used by RIDEM. Noncarcinogenic risks for the residential child (age 1 - 6) and residential adult did not exceed a HI of 1 for any target organ group (Tables 6-9.10 and 6-9.11).

The estimated RME ICR for an excavation worker exposed to surface soil was 1.4×10^{-6} (see Table 6-9.12). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, and less than the 1×10^{-5} ICR benchmark used by RIDEM. Noncarcinogenic risks did not exceed a HI of 1 for any target organ group.

The estimated percentage of children exposed to subsurface soil that are predicted to exhibit a blood lead level above 10 ug/dL is 18.6 percent (Appendix Q). This exceeds EPA's protective level cutoff of 5 percent and indicates that adverse effects cannot be ruled out from lead exposure to residential children under these conditions.

6.7.3 Sediment

The estimated RME ICR for a lifetime resident exposed to sediment was 2.2×10^{-5} (see Table 6-9.13). The ICR was within EPA's target risk range of 1×10^{-4} to 1×10^{-6}, but slightly greater than the 1×10^{-5}

ICR benchmark used by RIDEM. Noncarcinogenic risks for the residential child (age 1 - 6) and residential adult did not exceed a HI of 1 for any target organ group (Tables 6-9.14 and 6-9.15).

The estimated RME ICR for a shoreline visitor youth (age 1 - 12) exposed to sediment was 1.1 x 10^{-6} (see Table 6-9.16). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6} and less than the 1 X 10^{-5} ICR benchmark used by RIDEM. Noncarcinogenic risks for the shoreline visitor child (age 1 - 4), and shoreline visitor pre-adolescent/adolescent (age 5 - 12) did not exceed a HI of 1 for any target organ group (Tables 6-9.16 and 6-9.17).

6.7.4 Lobster Ingestion

RME Risks

The estimated RME ICR for a subsistence fisherman exposed to lobster was 1.4 x 10^{-3} (see Table 6-9.18). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.1, the primary contributors to the cancer risk were arsenic, PCBs, dieldrin, and PAHs, including benzo(a)pyrene and benzo(b)fluoranthene.

The estimated RME HI for a subsistence fisherman exposed to lobster was 27.2 (Table 6-9.18), which exceeded the acceptable level of 1.0. As shown on Table 6-10.1, the target organs and the principal COPCs contributing to noncancer risk were: skin (arsenic and PCBs), CNS (mercury), kidney (cadmium and chromium), and eye (PCBs).

The estimated RME ICR for a lifetime recreational receptor exposed to lobster was 1.1 x 10^{-4} (see Table 6-9.19). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.2, the primary contributors to the cancer risk were arsenic, PCBs, and PAHs, including benzo(a)pyrene and benzo(b)fluoranthene.

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the recreational child (age 1 - 6) and the recreational adult (see Tables 6-9.20 and 6-9.21, respectively).

The estimated percentage of children exposed to lead from consumption of lobster obtained during recreational fishing that are predicted to exhibit a blood lead level above 10 ug/dL is 55.5 percent (Appendix Q). A lead concentration of 15.9 mg/kg in lobster is associated with a 95 percent fetal blood lead value of 40.2 ug/dL for a pregnant adult whose dietary intake includes daily consumption of lobster obtained from subsistence fishing. These values exceed EPA's protective level cutoff of 10 ug/dL and indicate that adverse effects cannot be ruled out from lead exposure.

CTE Risks

The estimated CTE ICR for a subsistence fisherman exposed to lobster was 5.3 x 10-4 (see Table 6-9.22). The ICR exceeded EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. The primary contributors to the cancer risk were arsenic, PCBs, dieldrin, and benzo(a)pyrene (Table 6-10.3).

The estimated CTE HI for a subsistence fisherman exposed to lobster was 27.2 (Table 6-9.22), which exceeded the acceptable level of 1.0. As shown on Table 6-10.3, the target organs and the principal COPCs contributing to noncancer risk were: skin (arsenic and PCBs), CNS (mercury), kidney (cadmium and chromium), and eye (PCBs).

The estimated CTE ICR for a lifetime recreational receptor exposed to lobster was 4.2 x 10^{-5} (see Table 6-9.23). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.4, the primary contributors to the cancer risk were arsenic, PCBs, and benzo(a)pyrene.

6.7.5 Clams Ingestion

RME Risks

The estimated RME ICR for a subsistence fisherman exposed to clams was 1.7 x 10^{-3} (see Table 6-9.24). The ICR slightly exceeded EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.5, the primary contributors to the cancer risk were arsenic, PCBs, dieldrin, and PAHs, including benzo(a)pyrene, benzo(b)fluoranthene), and benzoanthracene.

The estimated RME HI for a subsistence fisherman exposed to clams was 33.3 (Table 6-9.24), which exceeded the acceptable level of 1.0. As shown on Table 6-10.5, the target organs and the principal COPCs contributing to noncancer risk were: skin (arsenic and PCBs), CNS (mercury), kidney (cadmium and chromium), and eye (PCBs).

The estimated RME ICR for a lifetime recreational receptor exposed to clams was 1.4 x 10^{-4} (see Table 6-9.25). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by. As shown on Table 6-10.6, the primary contributors to the cancer risk were arsenic and PCBs.

The estimated RME HI for a recreational child (age 1 - 6) exposed to clams was 2.8 (Table 6-9.26), which exceeded the acceptable level of 1.0. One target organ, skin, exhibited a HI greater than 1.0, for which the principal COPCs contributing to noncancer risk were arsenic and PCBs (see Table 6-10.7).

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the recreational adult (see Tables 6-9.27).

The estimated percentage of children exposed to lead from consumption of clams obtained during recreational fishing that are predicted to exhibit a blood lead level above 10 ug/dL is 16.5 percent (Appendix Q). A lead concentration of 5.45 mg/kg in clams is associated with a 95 percent fetal blood lead value of 16.4 ug/dL for a pregnant adult whose dietary intake includes daily consumption of clams obtained from subsistence fishing. These values exceed EPA's protective level cutoff of 10 ug/dL and indicate that adverse effects cannot be ruled out from lead exposure.

CTE Risks

The estimated CTE ICR for a subsistence fisherman exposed to clams was 6.5 x 10^{-4} (see Table 6-9.28). The ICR exceeded EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.8, the primary contributors to the cancer risk were arsenic, PCBs, dieldrin, and benzo(a)pyrene.

The estimated CTE HI for a subsistence fisherman exposed to clams was 27.7 (Table 6-9.28), which exceeded the acceptable level of 1.0. As shown on Table 6-10.8, the target organs and the principal COPCs contributing to noncancer risk were: skin (arsenic and PCBs), CNS (mercury), kidney (cadmium and chromium), and eye (PCBs).

The estimated CTE ICR for a lifetime recreational receptor exposed to clams was 5.1 x 10^{-5} (see Table 6-9.29). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.9, the primary contributors to the cancer risk were arsenic and PCBs.

The estimated CTE HI for a recreational child (age 1 - 6) exposed to clams was 2.3 (Table 6-9.30), which exceeded the acceptable level of 1.0. One target organ, skin, exhibited a HI greater than 1.0, for which the principal COPCs contributing to noncancer risk were arsenic and PCBs (see Table 6-10.10).

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the recreational adult (see Tables 6-9.31).

6.7.6 Blue Mussels Ingestion

RME Risks

The estimated RME ICR for a subsistence fisherman exposed to blue mussels was 4.4 x 10^{-4} (see Table 6-9.32). The ICR was greater than EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.11, the primary contributors to the cancer risk were arsenic, PCBs, dieldrin, and PAHs: benzo(a)pyrene, benzo(b)fluoranthene, benzoanthracene, and dibenzo(a,h)anthracene.

The estimated RME HI for a subsistence fisherman exposed to blue mussels was 24.5 (Table 6-9.32), which exceeded the acceptable level of 1.0. As shown on Table 6-10.11, the target organs and the principal COPCs contributing to noncancer risk were: skin (arsenic and PCBs), CNS (mercury), kidney (cadmium and chromium), and eye (PCBs).

The estimated RME ICR for a lifetime recreational receptor exposed to blue mussels was 3.5 x 10^{-5} (see Table 6-9.33). The ICR was within EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM to assess the need for remedial action. As shown on Table 6-10.12, the primary contributors to the cancer risk were arsenic and PCBs.

Noncarcinogenic risks did not exceed a HI of 1.0 for any target organ group for the other receptors evaluated, including the recreational child (age 1 - 6) and the recreational adult (see Tables 6-9.34 and 6-9.35, respectively).

The estimated percentage of children exposed to lead from consumption of blue mussels obtained during recreational fishing that are predicted to exhibit a blood lead level above 10 ug/dL is 13.6 percent (Appendix Q). A lead concentration of 4.62 mg/kg in blue mussels is associated with a 95 percent fetal blood lead value of 14.5 ug/dL for a pregnant adult whose dietary intake includes daily consumption of blue mussels obtained from subsistence fishing. These values exceed EPA's protective level cutoff of 10 ug/dL and indicate that adverse effects cannot be ruled out from lead exposure.

CTE Risks

The estimated CTE ICR for a subsistence fisherman exposed to blue mussels was 1.6 x 10^{-4} (see Table 6-9.36). The ICR was at the upper end of EPA's target risk range of 1 x 10^{-4} to 1 x 10^{-6}, and exceeded the 1 X 10^{-5} ICR benchmark used by RIDEM. As shown on Table 6-10.13, the primary contributors to the cancer risk were arsenic, PCBs, dieldrin, and benzo(a)pyrene.

The estimated CTE HI for a subsistence fisherman exposed to blue mussels was 21.9 (Table 6-9.36), which exceeded the acceptable level of 1.0. As shown on Table 6-10.13, the target organs and the principal COPCs contributing to noncancer risk were: skin (arsenic and PCBs), CNS (mercury), kidney (cadmium and chromium), and eye (PCBs).

7.0 MARINE ECOLOGICAL RISK ASSESSMENT SUMMARY

A Marine Ecological Risk Assessment (ERA) was prepared for the offshore portion of the OFFTA site by Science Applications International Corporation (SAIC) and the University of Rhode Island (URI) Graduate School of Oceanography, under contract to TtNUS. The ERA reflects only current conditions and levels of activity at the site; altered risks from potential future use scenarios involving fundamentally different conditions or site activities were not addressed as part of this ERA. This section summarizes the marine ERA, as presented in the OFFTA Marine ERA Report (the ERA Report) prepared by SAIC/URI, dated April 2000.

Section 2.5 of this Draft Final RI Report summarizes the field activities conducted to support the marine ERA, including a description of the sediment and biota sampling and analysis. Refer to the marine ERA Report (SAIC/URI 2000) for a comprehensive discussion of the investigation and results, including: problem formulation, sampling and analysis summary and site characterization, exposure assessment, ecological effects assessment, risk characterization, risk uncertainty and limitations discussion, and conclusions and recommendations. The text that follows is taken from the ERA Report.

The objectives of the marine ERA were to:

- Assess the site-related ecological risks to the offshore environments of Coddington Cove and Narragansett Bay from chemical stressors associated with OFFTA, and

- Develop sufficient information to support risk management decisions regarding site-specific remedial options.

- Support communication to the public of the nature and extent of ecological risks associated with Old Fire Fighting Training Area.

Risk Assessment Methods

In order to characterize marine ecological risks associated with the OFFTA study area, the ERA included the assessment of several exposure and ecological effects endpoints, and used a weight of evidence (WoE) approach, involving:

- Analysis of contaminant concentrations versus observations of adverse effects
- Analysis of contaminant bioaccumulation
- Comparisons of toxicity evaluations with observed ecological effects

- Comparisons of exposure point concentrations with established standards and criteria for offshore media
- Comparisons of exposure point concentrations with published toxicity information
- Qualitative comparisons of apparent adverse impacts with conditions at reference stations.

Exposure-based and effects-based weights of evidence, chemical exposure rankings and biological effects rankings, and characterization of risk probability for each sampling station are summarized in Table 7-1, which uses four levels of adverse exposure or effects probability to describe the data: baseline, (- or B), low (+ or L), intermediate (++ or I), and high probability of site-related effects or risk (+++ or H). Baseline is presumed to be equivalent of areas unaffected by contaminants.

The chemical-exposure-based weights of evidence assess chemical exposures in:

(1) Bedded Sediment: Chemical concentrations of contaminants of concern (CoCs) measured in sediments and porewater were compared to benchmarks to predict potential adverse effects on targ t species from exposure to contaminants in surface sediments.

(2) Resuspended Sediment: Sediment-water mixtures (elutriates) were prepared for most sample stations and were chemically analyzed to predict worst-case impacts of sediment resusp nsion events on target species.

(3) Bioconcentration (Organism Tissues): Bioconcentration of CoCs in site receptors was assessed by calculating the ratio of the contaminant residue found in a receptor organism at the site to that found at the reference location.

The effects-based weights of evidence assess:

(1) Sediment Toxicity: Toxicity endpoints allow assessment of chemical exposure as well as potential impacts on target receptors. Sediment tests on amphipods, and porewater and elutriate tests on s a urchin larvae were used to assess possible impacts from in-place and resuspended sediments, respectively.

(2) Field Effects: Field effects parameters include benthic community structure, shellfish condition and blood disorders, increased enzyme activity in fish, and predicted effects on predatory birds.

(3) Tissue Residue Effects: Possible impacts of contaminant residues in target species were assessed separately through a comparison of body burdens with Tissue Screening Concentration (TSC) and Critical Body Residue (CBR) benchmarks.

The overall ranking of "risk probability" (low, intermediate, or high) for each sampling station was derived using the exposure-based and effects-based rankings, as summarized in Table 7-1. A summary of the marine ecological risk assessment findings is presented below.

Findings and Recommendations of the ERA Report

Estimated ecological risks to the aquatic species of concern (mussels, clams, lobster, cunner and seabirds) at the OFFTA study area were assessed and grouped by sampling station using four classes of risk, as stated above: baseline, low, intermediate, and high. The risks are based primarily upon summaries of each weight of evidence, particularly agreement between exposure and effects-based weights of evidence. Sample station locations and their corresponding assigned ecological risk probabilities are presented in Figure 7-1 and Table 7-1. A summary of the sampling stations according to their assigned probable risk category is presented below, with conclusions and recommendations for consideration in the risk management decision process:

High Risk: Only one station, OFF-05, was determined to pose a "high" probability of ecological risk. The CoCs posing the primary risk were organics (PAHs) and the metals cadmium, chromium, and copper. Plausible exposure-response relationships were observed for sediment PAHs with toxicity to amphipods, and porewater PAHs with toxicity to sea urchins. Based on the demonstrable exposure-response relationships observed and the extent of adverse exposure and effects, the ecological risk at this station is considered unacceptable, and this location should receive the highest priority in risk management decisions.

Intermediate Risk: Ten stations were determined to pose a probable "intermediate" level of ecological risk: OFF-02, OFF-04, OFF-06, OFF-09, OFF-13, OFF-15, OFF-17, OFF-18, OFF-21, and reference station OFF-23. Generally similar receptors and CoCs as those observed for the "high" risk station were of concern, but at lower levels at these "intermediate" risk stations. Indications of CoC exposure were most evident in comparing tissue concentrations at sample stations to the reference station values. Indications of "effects" included tissue residue effects and some sediment toxicity and field effects.

This level of risk was assigned to stations where multiple weights of evidence clearly indicate that significant exposure or adverse effects are present; where suggestive, but perhaps not highly quantitative, exposure-response relationships are indicated; or where observed impacts are apparently highly localized or of very limited duration. At the "intermediate" risk stations, considerable uncertainty exists as to the degree to which CoC-related impacts have contributed to observed effects. Based on the observations summarized above, the overall ecological risks at these stations are considered acceptable from an ecological perspective; but because of the high degree of uncertainty, these stations should be evaluated in the risk management decision process.

Low Risk: Twelve stations were determined to pose a probable "low" level of ecological risk: OFF-01, OFF-03, OFF-07, OFF-08, OFF-10, OFF-11, OFF-12, OFF-14, OFF-16, OFF-19, OFF-20, and reference station OFF-22. The data for these stations suggest possible adverse exposure or effects, however, CoC concentrations were generally low, and definitive exposure-response relationships were not observed. Indications of "effects" included tissue residue effects and some sediment toxicity and field effects. The magnitude of observed effects was relatively minor, with no discernable relationship to CoC concentrations.

Based on the observations summarized above, the ecological risks at these stations are considered acceptable from an ecological perspective, and these locations should receive relatively low priority in risk management decisions.

Baseline Risk: Since none of the stations, including the two reference stations, are considered to represent relatively "pristine" environmental conditions, none of the stations were assigned a baseline risk. The lack of baseline conditions throughout the study area is attributed to the presence of potential non-site-related contaminant sources in the area, including the City of Newport Wastewater Treatment Plant outfall, stormwater outfalls, and numerous industrial/recreational operations in nearby Newport Harbor.

8.0 SUMMARY AND CONCLUSIONS

This section provides a summary of the Old Fire Fighting Training Area (OFFTA) RI activities, findings and conclusions.

8.1 OBJECTIVES

The general objectives of the OFFTA RI site investigation are to determine the nature and extent of site contamination, sources of contamination, potential contaminant migration pathways, potential contaminant receptors, and associated exposure pathways. The scopes of the sampling efforts for this site were developed to meet site-specific RI/FS objectives as follows:

- Determine the site background soil and groundwater quality
- Determine the nature and extent of site surface soil contamination
- Determine the nature and extent of site subsurface soil contamination
- Determine the nature of the soil mounds on the site
- Determine the nature and extent of groundwater contamination
- Determine the nature and extent of sediment and biota contamination in the marine environment adjacent to the site
- Determine the fate and transport of contaminants in site media
- Determine the risks posed by site contaminants to humans and the environment

8.2 SITE DESCRIPTION

The OFFTA site is located at the northern end of Coasters Harbor Island. The site occupies approximately 5.5 acres and is bordered by Taylor Drive to the south and is surrounded by Coasters Harbor (part of Narragansett Bay) to the east, north, and west. The site contains a picnic area, playground, and baseball field. A one-story concrete block building (Building 144) is located along the southern side of the site. The building and recreational facilities at the site are not currently in use. A chain link fence along its eastern, southern, and western sides restricts access to the site.

Unique topographic features at the site include two soil mounds: one that is approximately 20 feet high (30 ft. above mean low water (MLW)) located in the center of the site, and another that is approximately 6 feet high (16 ft. above MLW) located on the western side of the site. The rest of the site is generally flat, with surface elevations ranging from 8 to 12 feet above MLW. With the exception of the baseball infields, the site is entirely vegetated with grass.

8.3 SITE HISTORY

The site was home to a Navy fire fighting training facility from World War II until 1972. During the training operations, fuel oils were ignited in various structures at the site that simulated shipboard compartments, and then extinguished by sailors. It was reported that the two buildings had a water/oil mixture injected into them, which was set on fire for fire fighting practice. Underground piping reportedly carried the water/oil mixture to the buildings and from the buildings to an oil-water separator. There is no other known information available concerning the prior fire fighting training operations.

The fire fighting training facility was closed in 1972. Upon closure, the training structures were reportedly demolished and buried in two mounds on the site, then the entire area was covered with topsoil. The site was then converted to a recreational area (Katy Field) with a playground, a picnic area with an open pavilion and barbecue grills, and a baseball field. The field was dedicated on July 4, 1976 and used as a recreational area until its closure in October 1998 due to potential environmental and human health concerns.

In its 22 years of use as recreation area, the site was used for organized activities including youth day camps, picnic functions, and little league baseball (1 year only), as well as for general recreation. A child day care center operated out of Building 144 on the site from approximately 1983 through January 1994 when it was relocated off-site to a larger facility on base.

8.4 STUDY AREA INVESTIGATIONS

This report is based on the various investigations conducted for the OFFTA site since 1990. Phase I and Phase II remedial investigations for the site were conducted by TRC Environmental Corporation (TRC) in the early 1990s. The Phase I RI site investigation activities were conducted by TRC between April and July 1990 and included a soil gas survey, geophysical surveys, surface soil sampling, soil boring sampling, and monitoring well installation and sampling. The Phase II RI field investigation activities were conducted by TRC between October 1993 and January 1994 to further delineate the presence, nature, and extent of any contamination associated with the site. The Phase II field investigation activities included geophysical and soil gas surveys, surface soil sampling, test pit sampling, soil boring sampling, groundwater sampling, and storm sewer sampling. Based on the findings of these investigations and regulatory review it was determined that the RI report could not be finalized until additional offshore ecological characterization was completed and the results integrated into a revised Draft Final RI Report.

The offshore ecological investigations were conducted in 1998 and a Marine Ecological Risk Assessment (ERA) for the site was completed in April 2000. Additionally, TtNUS conducted three supplemental investigations between 1997 and 2000: a Source Removal Evaluation, a Phase III RI and Human Health Risk Assessment for Recreational Use of the site, and a Background Soil Investigation. The findings of these investigations are also integrated into this revised Draft Final RI report.

8.5 GEOLOGY AND HYDROGEOLOGY

The geologic and hydrogeologic conditions at the OFFTA Site have been determined using data from the various site investigations. This evaluation indicates that the site is underlain by the following materials: fill, consisting of construction debris and sand and gravel; silty sand and gravel; sand and gravel; peat and silt layer; and glacial till consisting of silt sand and gravel. The thickness of the overburden deposits range from about 6 to 27 feet thick, excluding the elevated mound areas located on the site. The data from the monitoring wells indicate that the groundwater table occurs in the overburden across most of the site but the water table lies in the bedrock in the eastern and southeastern portions of the site.

The bedrock at the site has been described as a conglomerate. The bedrock may contain localized units of sandstone. In addition the conglomerate is believed to be in contact with the Rhode Island formation. The Rhode Island Formation consists of metaconglomerates and metasandstones, as well as schist, carbonaceous schist, and graphite. The bedrock in the central portion of the site was blasted as part of the development of the site. The blasting may have increased the fracture density in the bedrock in the areas of blasting and resulted in localized areas of higher hydraulic conductivity.

The groundwater elevations indicate that the groundwater at the site in general flows toward Narragansett Bay and Coasters Harbor located to the north to northwest and the east to northeast of the site, respectively. The depth to groundwater ranges from 4 to 9 feet below ground surface. Further review of the groundwater maps indicates that locally the groundwater flow can be impacted by groundwater recharge events such a rain storms. This change in the groundwater flow pattern is believed to be caused by the presence of relatively impermeable paved areas on the site and adjacent to the site. These paved areas reduce the rate of groundwater recharge compared to the unpaved areas of the site.

A tidal influence study indicates that a tidal influence is felt along the shoreline in both the overburden and bedrock aquifers but this influence does not extent beyond the shoreline.

The vertical groundwater gradients observed at monitoring well clusters indicate that both upward and downward vertical gradients were observed during the investigation. The vertical gradients in the up gradient monitoring well cluster MW-6 vary seasonally in response to changes in seasonal recharge events. The direction and magnitude of the vertical gradients in the shoreline well clusters MW-2 and MW-11 appear to be influenced by the changes in surface water elevations caused by the tides.

The horizontal groundwater gradients at the site were greater in the central and eastern portion of the site. The western portion of the site had a smaller gradient compared to the eastern portions of the site. This smaller gradient is due the greater thickness of the overburden at this location.

The hydraulic conductivity of the overburden and bedrock aquifers was estimated using slug tests. This testing indicated that the hydraulic conductivity in the bedrock ranged from 0.61 feet per day at MW-6R to 120 feet per day at MW-11S. The well screen at MW-11S is set in fill material that includes construction debris and is not considered to be representative of the natural deposits. Hydraulic conductivity in the natural overburden deposits at the site ranges from 0.74 to 41 feet per day. The higher values are associated with the sand and gravel deposits at the site and the lower values are associated with the silty sandy gravels. This highest bedrock hydraulic conductivity measured was at monitoring well MW-8. This well is located in the area of the site where blasting was conducted as part of the site development activities.

The estimated average linear groundwater velocity at the site ranged from 0.39 feet per day to 3.1 feet per day. The higher values were calculated for the western portion of the site where the hydraulic conductivity of the overburden is greatest.

The overall conclusions regarding the site hydrogeology are as follows:

- Groundwater flows from the site and any potential source areas toward Narragansett Bay and Coasters Harbor.
- The groundwater flow rate is higher in the overburden compared to the bedrock aquifer.
- The groundwater migrates at the site at an estimated rate of between 145 feet per year (0.39 feet per day) and 1,131 feet per year (3.1 feet per day). At this rate of groundwater movement it is estimated that groundwater from the upgradient side of the site would discharge into the surface water within 1 to 2 years or sooner. The actual time would depend on the location of the release relative to the surface water and the actual groundwater velocity.

8.6 NATURE AND EXTENT OF CONTAMINATION

Results of the investigations indicated that site activities have resulted in the release of both organic and inorganic contaminants. A summary of the nature and extent of site contamination follows.

A few volatile organic compounds (VOCs) were detected in surface soils, subsurface soils and shoreline sediments at low concentrations below RIDEM residential soil criteria. VOCs were also detected in groundwater at concentrations below the RIDEM GB groundwater objective.

Semi-volatile organic compounds (SVOCs) were detected in all media across the site. The most prevalent detected SVOCs were PAHs. PAHs were detected at their highest concentrations in surface and subsurface soil and groundwater sample locations adjacent to Coasters Harbor. PAHs were also detected in all shoreline sediment locations, marine sediment stations, and storm water samples. The highest concentrations in marine sediment were detected at sampling stations nearest the shore in the vicinity of the central portion of the site. Only non-carcinogenic PAHs were detected in storm water samples. PAHs were detected in biota samples from all sampling stations. In clam tissue samples, the highest concentrations were detected in samples northwest of the site and at the reference station. In blue mussel tissue samples, the highest concentrations were detected in samples near the shore east of the site and at the reference station. In lobster tissue samples, the highest concentrations were detected in samples from a distant area opposite the central portion of the site. In fish tissue samples, the highest concentrations were detected in samples nearest the shore in the vicinity of the central portion of the site. Concentrations of PAHs in surface soils, subsurface soils, and shoreline sediments exceeded RIDEM Residential Direct Exposure Criteria for soils. Other SVOCs, other than PAHs, were detected infrequently and in low concentrations in surface soils, subsurface soils, groundwater, and storm water. None of these exceeded RIDEM Residential Direct Exposure Criteria for soils.

Pesticides were detected in surface soils and subsurface soils across the site, in storm water, marine sediments, and in biota samples. Only one pesticide, endrin, was detected in groundwater. All pesticide concentrations were low. Among biota, the highest pesticide concentrations were detected in lobster. The highest marine sediment pesticide concentrations were detected off-shore east of the site.

PCBs were detected infrequently in surface and subsurface soils at concentrations below RIDEM Residential Direct Exposure Criteria for soils. PCBs were detected frequently in biota tissue samples. In clam tissue samples, the highest concentrations were detected in samples off-shore near the central portion of the site. In blue mussel tissue samples, the highest concentrations were detected in samples near shore in the vicinity of the central portion of the site. In lobster tissue samples, the highest concentrations were detected in samples from a distant area opposite the central portion of the site. In fish tissue samples, the highest concentrations were detected in samples in the near-shore area at the west end of the site. The fish tissues were found to contain higher concentrations of PBCs relative to other organisms.

Metals were detected throughout the site. Many are the result of natural breakdown of soils and the parent bedrock and are naturally occurring in low concentrations. Concentrations of metals in site soils and groundwater were compared to site-specific background or upgradient samples. In general, metals were detected in higher concentrations on-site. In surface soils the metals detected most frequently at concentrations greater than background were arsenic, magnesium, and potassium. Arsenic, beryllium, lead and manganese in surface soils exceeded the RIDEM Residential Direct Exposure Criteria for soils. The highest concentrations of arsenic were detected in surface soils from the central portion of the site. In subsurface soils the metals detected most frequently at concentrations greater than background were barium, calcium, copper, lead, potassium, and zinc. Arsenic, antimony, beryllium, lead and manganese in subsurface soils exceeded the RIDEM Residential Direct Exposure Criteria for soils. The highest concentrations of arsenic were detected in subsurface soils from the central portion of the site.

Concentrations of metals in site groundwater were compared to upgradient samples. In groundwater the metals detected most frequently at concentrations greater than upgradient groundwater samples were calcium, iron, magnesium, potassium, and sodium. The highest concentrations of metals were detected in samples from the north and central portions of the site. Nickel and copper concentrations in storm water samples exceeded marine AWQCs.

Metal concentrations detected in shoreline sediments were comparable to surface soil samples. Arsenic, beryllium, lead and manganese in shoreline sediments exceeded the RIDEM Residential Direct Exposure Criteria for soils. No spatial pattern was evident in marine sediment sample metal concentrations. Metals detected in biota sampling revealed no relative differences between samples and no differences from reference stations, with the exception of silver concentrations in lobster. Concentrations of silver in lobster tissue samples obtained from the western boundary of the study area were greater than other areas.

All surface soil samples analyzed for dioxins detected low dioxin concentrations (TEQs) well below the accepted dioxin residential clean-up goal of 1ppb.

Total petroleum hydrocarbons (TPHs) were detected in subsurface soils throughout the site. Detected TPH concentrations exceed the RIDEM Residential Direct Exposure Criteria for soils at depths of 3-11 feet bgs. Visually observable petroleum contamination was noted in the central portion of the site in soils sampled immediately above the water table.

Finally, an investigation to locate potential discrete contaminant sources at the site and determine whether site conditions warranted a removal action to protect public health, welfare, or the environment determined that there were no discrete contaminant sources. The investigation focused on defunct underground oil and fuel storage tanks and piping, subsurface drains, eroding asphaltic materials eroding along the shoreline, and free product (petroleum hydrocarbons.

8.7 FATE AND TRANSPORT

Spills and leaks of petroleum-based fuels and deposition of fuel combustion byproducts have introduced a wide range of petroleum hydrocarbons into the OFFTA site soils. Over the many years since fire fighting training activities have ceased, most of the volatile and soluble petroleum hydrocarbons have apparently partitioned to the vapor phase or dissolved phase and have been degraded or transported off-site, leaving behind a relatively insoluble and recalcitrant petroleum residue. The much less soluble and volatile polycyclic aromatic hydrocarbons (PAHs) are still present at high concentrations in the soils in the central portion of the site. These contaminants will continue to leach into the groundwater, but the solubility and adsorptive properties of these contaminants should keep groundwater PAH concentrations low. The PAHs in nearshore marine sediments likely originated from off-site as well as onsite sources.

Most of the arsenic and chromium in the OFFTA soils and groundwater may be naturally occurring. The near neutral pH and low dissolved oxygen content of the groundwater enhance the mobility of arsenic. By contrast, the presence of organic carbon in the soil zone and reducing conditions in the aquifer reduce the mobility of chromium in both environments. Off-site sources are probably a major contributor to the high chromium concentrations observed in marine sediments.

Lead concentrations in soil samples were often much higher than those in background samples, indicating the presence of lead contamination in the site soils. The lead appears to be immobilized by mineral solubility constraints and adsorption to soil organic matter, clay minerals, and metal oxyhydroxides. The lead in the marine sediments probably originated from both onsite and off-site sources.

8.8 HUMAN HEALTH RISK ASSESSMENT

The Baseline Human Health Risk Assessment provided in Section 6 evaluated exposure to surface soil, subsurface soil, sediment, and shellfish (lobsters, clams, and mussels). Although finfish samples were collected at the site, the fish collected are not an edible species, and it is believed that the shellfish ingestion would pose a higher, and thus more conservative risk. This risk assessment considered exposures under residential scenario, recreational and visitor scenarios, and a worker scenario, as well as ingestion of shellfish taken recreationally and for subsistence.

For surface soil, the cancer risks under the residential, recreational, and worker scenarios were 2.5E-5, 5.4E-6, and below 1E-6, respectively. Based on surface soil lead levels the estimated percentage of residential children exposed to surface soil that are predicted to exhibit a blood lead level above 10 ug/dL is 0.03 percent. For subsurface soil, cancer risks under the residential and worker scenarios were 4.0E-5, and 1.4 E-6, respectively. No recreational exposures were calculated for subsurface soils. Based on subsurface lead levels the estimated percentage of residential children exposed to subsurface soil that are predicted to exhibit a blood lead level above 10 ug/dL is 18.6 percent. Non cancer risks for surface and subsurface soil under all scenarios did not exceed 1.0 for any target organ group.

For sediment, the cancer risks under the residential and recreational (shoreline visitor) scenarios were 2.2E-5 and 1.6E-6 respectively. Non cancer risks for sediment did not exceed 1.0 for any target organ group.

For shellfish ingestion, the cancer risks exceeded the risk range of 1E-4 to 1E-6 under the subsistence fishing and lifetime recreational scenarios for lobster, clams, and mussels. Primary contributors to these risks is arsenic, and other contributors include PCBs, PAHs, mercury, cadmuim and chromium as calculated from analytical results.

It should be noted that the subsistence fishing scenario does not currently exist and is unlikely in the future because of the current ban on shellfishing in the area, the unrealistic assumption that all of the fisherman's catch would be obtained continually from waters adjacent to the OFFTA site, and because there are no local cultures (such as Native Americans) involved in subsistence fishing in this area

Arsenic is present in fish and shellfish tissue in an organic form of arsenobetanine, which is non-toxic. The risk calculations are performed based on the presence of this arsenic present as inorganic arsenic. Therefore, the risk values for seafood ingestion from this site are biased high and could be overestimated by as much as a factor of 10. In addition, the exposure scenarios used for the risk assessment, particularly the use of subsistence fishing, are biased high and it is highly unlikely that exposures to the degree used for risk estimation could effectively be achieved.

8.9 ECOLOGICAL RISK ASSESSMENT

The ecological risk assessment (SAIC, 2000) was performed to assess ecological risks to the offshore environments of Coasters Harbor and Narragansett Bay from contaminants associated with the OFFTA, and included exposure and effects assessments, a characterization of risk, risk synthesis, and uncertainty analysis.

Risks were identified by stations based on summaries of each weight of evidence, focusing on the exposure (contaminants present) correlated to effects (reproduction and growth inhibitions, etc). Stations were rated from these summaries to exhibit properties where there is high, intermediate and low probability for adverse risk to receptors present at those stations.

The assessment found a high probability for adverse risk at one station (station 5), close to the outfall at the central shoreline of the site, likely from PAHs and metals present at this area. Intermediate probability for risk was estimated for a number of stations at the nearshore area and in the harbor sediments, including one reference station south of Coasters Harbor, but because there was a lack of a clear exposure-response relationship found, these risks may be considered acceptable from an ecological perspective. Low probability for adverse risk was estimated for the remainder of the stations, including one reference station, and nearshore stations more exposed to rough water conditions. The observed risks at these stations are considered acceptable from an ecological perspective. A baseline condition associated with relatively pristine conditions was not observed at any of the site or reference stations evaluated in this assessment.

8.10 DATA LIMITATIONS AND UNCERTAINTIES

This section identifies site characterization data limitations and risk assessment uncertainties associated with the OFFTA RI.

8.10.1 Site Characterization Data Limitations

Site characterization data limitations and uncertainties for the OFFTA Site are discussed below. Although the soil and sediment sample data sets are considered representative of the site conditions a review of the sample data and distribution indicates potential data limitations exist.

Soil

Although samples were collected across the site, the horizontal distribution of sample locations is not uniform. Because the investigations focused on the location of the former fire training facilities the majority of soil samples were collected in the eastern and central portions of the site with less samples collected in the western portion of the site. The focused collection of samples in areas associated with fire fighter training and/or disposal locations tends to bias the sample database and hence receptor risks to represent areas of higher contamination. However, for the recreational receptor, activity patterns at the site would vary from day to day and result in an integrated exposure to soil locations that is essentially averaged over a larger portion of the site than just the central and eastern sections. Hence, the impact of focused sampling tends to bias risks high in favor of areas of contamination while long-term receptors would incur a lesser degree of exposure as a result of frequenting other, less impacted areas of the site.

Investigation results show that that the depth of contamination varies across the site. However the vertical distribution of contamination at specific locations is not well defined. Generally soil samples were selected laboratory analysis from the test pit or boring depth interval containing the strongest evidence of contamination (highest FID results or the strongest evidence of oil staining).

An extensive soil background study was conducted, so background comparison tests were able to demonstrate that some inorganics were not elevated above background. In addition, the overall soil sampling distribution, while it included a focused, non-random sampling strategy, extensively characterized the site and is unlikely to have missed any significant hot spots within the study area.

Characterization for soil petroleum contamination limited as it is based on visual and olfactory observations and limited soil sample TPH analysis. Only twelve of the subsurface soil samples, collected during the SRE, were analyzed for TPH.

Finally as stated in the site background discussions, the amount of debris buried on site upon demolition of the fire training facilities is not known.

Sediment

A sediment background study was not performed, so statistical background comparison tests were not conducted. The performance of a background study similar to that done for the surface soils on site may have been able to demonstrate that site-related concentrations of some inorganics are not elevated above background.

Sediment sampling distribution is limited. Only five sediment samples were along the shoreline at the mid-tide. Seven samples were collected from the nearshore marine sediment at and immediately below the low-tide line and sixteen samples were collected from offshore marine sediment seaward of the low-tide line. Samples at all stations included a depth interval of 0-0.5 feet and at three locations, sediment samples were collected to a maximum depth of approximately 3.5 feet. Therefore the horizontal and vertical distribution of contamination is limited within these data sets.

8.10.2 Risk Characterization Uncertainties

At the OFFTA Site, the distribution of sampling locations in some media of interest affects whether the data set is considered representative of potential site conditions for exposed receptors and impact the uncertainty for risk estimation. Significant uncertainties associated with the HHRA and ERA are discussed below. Section 6.6 provides an extensive discussion of uncertainties related to each component of the human health risk assessment (i.e., data collection/evaluation, exposure assessment, toxicity assessment, and risk characterization) and the effect of a particular uncertainty on the outcome of the assessment. Uncertainties associated with the ERA are presented in Section 6.7 of the marine ERA report (SAIC, 2000).

Limited background sample stations were available for fish and shellfish species. Consequently, statistical comparisons were not used to eliminate COPCs. Because the range of concentrations for the risk drivers arsenic, PCBs, and PAHs in background fish samples was very similar to that found in site-associated samples, inclusion of these chemicals as COPCs is likely to have significantly overestimated the risks attributable to the site. It was determined that additional background stations were not available due to the lack of similar environments within Narragansett Bay.

The constituents contributing the most to the shellfish ingestion cancer risks are arsenic, PCBs, and PAHs. However, the majority of these risks may not be related to contamination originating from OFFTA because the detected ranges of these substances were similar between background reference samples and samples associated with the site. A quantitative comparison of site versus background data was not possible for shellfish because limited availability of appropriate background shellfish sample stations for lobster, clams, and blue mussel prevented a confident statistical evaluation.

Arsenic was the constituent contributing the most to the surface soil and subsurface soil cancer risks. Arsenic was retained as a COPC because levels were statistically elevated above background in surface soil and subsurface soil. However, the data suggest an across-the-board trend of mildly elevated levels across the whole data set and not a marked difference in the number of arsenic hot spots or their upper concentrations.

Site-related risks from arsenic in subsurface soil are estimated to be less than background-related risks from arsenic in subsurface soil. This is because the arsenic RME EPC in subsurface soil is 10.1 mg/kg, which is less than the EPC for arsenic in background subsurface soil (26.1 mg/kg). This was not the case for surface soil, where the EPC for site data (6.36 mg/kg) was slightly more than the EPC for background data (3.98 mg/kg).

ICRs and HIs are summed for all potential COPCs and for all applicable routes of exposure. Summing the risks implies that no antagonistic or synergistic effects exist between chemicals and also assumes that similar mechanisms of action and metabolism are prevalent. The use of this approach, based on current EPA guidance, may either underestimate or overestimate the risks, depending on the chemical-specific interactions, which cannot be predicted. The direction of the uncertainty cannot be defined.

Risks to any individual may also be overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may be exposed via all pathways considered.

With regard to uncertainty associated with the marine ERA, considerable uncertainty exists as to the degree to which COC-related impacts have contributed to observed effects at the "intermediate" risk stations.

8.11 CONCLUSIONS

Based on the RI findings, conclusions for the media of interest at the OFFTA site are as follows:

Soil

Although the estimated RME incremental cancer risks for a lifetime resident exposed to surface soil and subsurface soil are within EPA's target risk range of 1×10^{-4} to 1×10^{-6} they are slightly greater than the 1×10^{-5} benchmark used by RIDEM. In addition, contaminants in the soil also exceed RIDEM's residential direct exposure criteria and GB leachability criteria. Lead levels in the surface soils are not predicted to result in blood-lead levels with potential for adverse effects to exposed residential children based on EPA's prot ctive level cutoff of 5 percent, while adverse effects cannot be ruled out from subsurface soil lead exposure to residential children. Therefore, a feasibility study should be prepared to develop and evaluate long-term soil response actions necessary to protect human health and groundwater quality. The soil feasibility study should consider the site characterization data limitations.

Shoreline Sediment

Sediment was found to pose cancer nsks through direct contact to human receptors above the target level. The estimated RME cancer risk for a lifetime resident is within EPA's target risk range but slightly greater than the 1×10^{-5} benchmark used by RIDEM. In addition, contaminant concentrations in the shoreline sediment exceeded RIDEM Residential Direct Exposure Criteria for soil. Therefore, a feasibility study should be prepared to develop and evaluate long-term sediment response actions necessary to protect human health. This marine sediment feasibility study should consider the shorelne sediment characterization data limitations.

Shellfish and Nearshore/Offshore Sediment

For shellfish ingestion, the cancer risks exceeded the risk range of 1×10^{-4} to 1×10^{-6} under the primary subsistence fishing and lifetime recreation scenarios. However, the subsistence fishing scenario and possibly the lifetime fishing scenario are not realistic.

Based on the observations summarized in the marine ERA, an exposure-response relationship was noted from PAHs at one station (high potential for risk). A number of other stations showed intermediate potential for risk (exposure or response, with no direct relationship found). While the intermediate risk stations are considered acceptable from an ecological perspective, the presence of the high-risk station indicates that these stations should be evaluated in the risk management decision process. Therefore, a feasibility study should be prepared to develop and evaluate long-term response actions necessary that protect ecological receptors.

Groundwater

The groundwater beneath Coasters Harbor Island (locality of the OFFTA site) is classified as GB, indicating that it is not suitable for use as a current or potential source of drinking water, as described in the Rhode Island Rules and Regulations for Groundwater Quality. Since groundwater contaminant levels do not exceed the RIDEM GB Groundwater Objectives and because federal MCLs are not applicable (the aquifer will not be used for drinking water) no further evaluation of groundwater other than monitoring is required.

TABLES

TABLE 2-1
PHASE I AND II RI TARGET COMPOUND LIST
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

TCL Volatiles	TCL Semivolatiles		TCL Pesticides/PCBs
Chloromethane	Phenol*	Acenapthene*	alpha-BHC
Bromomethane	bis(2-Chloroethyl)ether	2,4-Dinitrophenol	beta-BHC
Vinyl Chloride	2-Chlorophenol	4-Nitrophenol	delta-BHC
Methylene Chloride	1,3-Dichlorobenzene	Dibenzofuran	gamma-BHC(Lindane)
Acetone	1,4-Dichlorobenzene	2,4-Dinitrotoluene	Heptachlor
Carbon Disulfide	1,2-Dichlorobenzene	Diethyl Phthalate	Aldrin
1,1-Dichloroethene	2-Methyl Phenol	4-Chlorophenyl-phenylether	Heptachlor Epoxide
1,1-Dichloroethane	2,2'-oxybis(1-chloropropane)	Fluorene*	Endosulfan I
1,2-Dichloroethene (Total)	4-Methyl Phenol	4-Nitroanaline	Dieldrin
Chloroform	n-Nitro-di-n-Propylamine	4,6-Dinitro-2-methylphenol	4-4-DDE
1,2-Dichloroethane	Hexachloroethane	n-Nitrosodiphenylamine	Endrin
2-Butanone	Nitrobenzene	4-Bromophenyl-phenylether	Endosulfan II
1,1,1-Trichloroethane	Isophorone	Hexachlorobenzene	4,4-DDD
Carbon Tetrachloride	2-Nitrophenol	Pentachlorophenol	Endosulfan Sulfate
Bromodichloromethane	2,4-Dimethylphenol	Phenanthrene*	4,4-DDT
1,2-Dichloropropane	Benzoic Acid	Anthracene*	Methoxychlor
cis-1,3-Dichloropropene	2,4-Dichlorophenol	Carbazole	Endrin Ketone
Trichloroethene	1,2,4-Trichlorobenzene	di-n-Butyl Phthalate	Endrin Aldehyde
Dibromochloromethane	Naphthalene*	Fluoranthene*	alpha-Chlordane
1,1,2-Trichloroethane	4-Chloroaniline	Pyrene*	gamma-Chlordane
Benzene	Hexachlorobutadiene	Butyl Benzyl Phthalate	Toxaphene
Trans-1,3-Dichloropropene	4-Chloro-3-methylphenol	3,3'-Dichlorobenzidine	Aroclor - 1016
Bromoform	2-Methylnaphthalene*	Benzo(a)anthracene**	Aroclor - 1221
4-Methyl-2-Pentanone	Hexachlorocyclopentadiene	Chrysene**	Aroclor - 1232
2-Hexanone	2,4,6-Trichlorophenol	bis(2-Ethylhexyl) Phthalate	Aroclor - 1242
Tetrachloroethene	2,4,5-Trichlorophenol	di-n-Octyl Phthalate	Aroclor - 1248
1,1,2,2-Tetrachloroethane	2-Chloronaphthalene*	Benzo(b)fluoranthene**	Aroclor - 1254
Toluene	2-Nitroaniline	Benzo(k)fluoranthene**	Aroclor - 1260
Chlorobenzene	Dimethyl Phthalate	Benzo(a)pyrene**	
Ethylbenzene	Acenapthylene*	Indeno(1,2,3-cd)pyrene**	
Styrene	2,6-Dinitrotoluene	Dibenzo(a,h)anthracene**	
Xylene(Total)	3-Nitroanaline	Benzo(g,h,i)perylene**	

Notes: * = PAH ** = Carcinogenic PAH
Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 2-2
PHASE I AND II RI TARGET ANALYTE LIST
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

TAL Analytes	
Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Chromium	Sodium
Cobalt	Thallium
Copper	Vanadium
Iron	Zinc
Lead	Cyanide

Source. TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 2-3
PHASE II RI SURFACE SOIL SAMPLE DESCRIPTIONS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Sample I.D.	Date Sampled	Time Sampled	Soil Description
Surface Soil Samples			
FF-SS12	11/3/93	0850	Brown F-M SAND & ORGANICS, little gravel & rock fragments, dry, no odor, 0" to 9".
FF-SS13	11/3/93	0915	Brown F SAND & ORGANICS, some M sand, trace gravel & rock fragments, dry, no odor, 0" to 10".
FF-SS14	11/3/93	0930	Brown F SAND & ORGANICS, little silt, dry, no odor, 0" to 10".
FF-SS15	11/3/93	1005	Brown F SAND & ORGANICS, trace rock fragments, dry, no odor, 0" to 10".
FF-SS16	11/3/93	1035	Tan F SAND & ORGANICS, 0" to 3". Brown F SAND, little silt & organics, dry, no odor, 0" to 10".
FF-SS17	11/3/93	1100	Brown F SAND & ORGANICS, little silt & rock fragments, dry, no odor, 0" to 11".
FF-SS18	11/3/93	1120	Brown F SAND, some organics, little silt & rock fragments, 0" to 7".
FF-SS19	11/3/93	1200	Brown FILL, F sand & organics, little silt & gravel, dry, no odor, 0" to 12".
FF-SS20	11/3/93	1215	Brown FILL, F sand & rock fragments, little organics & silt, trace brick & asphalt, dry, no odor, 0" to 10".
FF-SS21	11/4/93	0805	Brown FILL, F-M sand & organics, some rock fragments, trace gravel & glass, dry, no odor, 0" to 9".
FF-SS22	11/4/93	0830	Brown FILL, F sand & organics, some rock fragments, trace M sand & silt, dry, no odor, 0" to 10".
FF-SS23	11/4/93	0850	Brown F SAND & ORGANICS, little silt, trace gravel & rock fragments, dry, no odor, 0" to 10".
FF-SS24	11/4/93	0905	Brown F SAND & ORGANICS, little silt & rock fragments, dry, no odor, 0" to 9".
FF-SS25	11/4/93	0925	Brown FILL, F sand & organics, some silt, little rock fragments, dry, no odor, 0" to 9".
FF-SS26	11/4/93	0950	Brown FILL, F sand & organics, trace M sand & gravel, dry, no odor, 0" to 9".
FF-SS27	11/4/93	1220	Brown F SAND & ORGANICS, trace gravel & rock fragments, dry, no odor, 0" to 12".
FF-SS28	11/4/93	1020	Brown F SAND & ORGANICS, trace rock fragments, dry, no odor, 0" to 8".
FF-SS29	11/4/93	1040	Brown F SAND & ORGANICS, some rock fragments, trace M sand, dry, no odor, 0" to 10".
FF-SS30	11/4/93	1125	Brown F SAND & ORGANICS, some silt, dry, no odor, 0" to 9".
FF-SS31	11/4/93	1200	Brown F SAND & ORGANICS, some rock fragments, trace gravel & M sand, dry, no odor, 0" to 10".
Soil Boring Surface Soil Samples			
FF-B81	11/22/93	0935	Brown FILL, F sand & organics, trace gravel & silt, 0" to 7". Grey FILL, F sand, brick, dry, no odor, 7 to 18"
FF-B91	11/23/93	0840	Brown FILL, F sand & organics, some rock fragments, dry, no odor, 0" to 12".
FF-B101	11/23/93	1420	Brown FILL, F sand & organics, some rock fragments, little asphalt & concrete, dry, no odor, 0" to 12".
FF-B111	11/24/93	0800	Brown FILL, F sand & organics, some rock fragments & gravel, dry, no odor, 0" to 12".

TABLE 2-3 (continued)
PHASE II RI SURFACE SOIL SAMPLE DESCRIPTIONS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Sample I.D.	Date Sampled	Time Sampled	Soil Description
Soil Boring Surface Soil Samples (continued)			
FF-B121	11/24/93	0812	Brown F SAND & SILT, some gravel, dry, no odor, 0" to 12".
FF-B131	11/23/93	1300	Brown FILL, F sand & brick fragments, dry, no odor, 0" to 12".
FF-B141	12/13/93	0910	Brown FILL, F sand & organics, trace rock fragments, dry, no odor, 0" to 12".
FF-B151	12/13/93	1315	Brown FILL, F sand & organics, some rock fragments, trace brick fragments, dry, no odor, 0" to 12".
FF-B161	11/23/93	0930	Brown F SAND & SILT, some organics, M sand, & gravel, dry, no odor, 0" to 11".
FF-B171	11/24/93	0717	Brown F SAND, some silt & M-C gravel, trace cobbles, dry, no odor, 0" to 12".
FF-B181	11/23/93	0810	Brown F SAND, trace silt, dry, no odor, 0" to 12".
Well Boring Surface Soil Samples			
FF-M61	11/30/93	0755	Brown TOPSOIL, 0" to 6". Brown F SAND, some silt, little gravel, trace asphalt, dry, no odor, 6" to 12".
FF-M71	11/29/93	1311	Brown F SAND, little cobbles, trace silt, 0" to 12".
FF-M81	11/30/93	1319	Brown TOPSOIL, 0" to 3". Brown F SAND, little cobbles, trace silt, dry, no odor, 3" to 12".
FF-M91	12/01/93	0715	Brown TOPSOIL, 0" to 6". Brown SILT & ROCK fragments, little F sand, dry, no odor, 6" to 12".
FF-M101	11/29/93	0825	Brown FILL, topsoil, 0" to 6". Brown FILL, F sand & silt, little brick fragments, dry, no odor, 6" to 12".
FF-M111	11/29/93	1020	Brown FILL, F sand & plastic, 0" to 3". FILL, black charred wood, little asphalt & concrete, dry, no odor, 3" to 12".

Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 2-4
PHASE II RI WELL DEVELOPMENT PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date	Pump Type/ Total Gal. Pumped	Time	pH	Temp (°C)	Conductivity (mmhos/cm)	Turbidity (NTU)	Observations
MW-2D	12/6/93	Centrifugal 95 gallons	10:45	12.06	19.0	3.05	>200	Dark grey, silty
			10:55	11.08	24.0	2.73	>200	
			11:05	10.19	23.2	3.03	116	
			11:15	10.25	23.2	2.96	127.3	
			11:25	10.11	23.9	2.71	119.7	
			11:35	9.98	24.4	2.73	121.4	
			11:45	9.94	25.3	2.76	104.7	
			11:55	10.35	23.2	2.57	>200	Increased pump rate
			12:15	11.32	19.1	2.79	>200	
			12:30	11.02	22.2	2.93	>200	
			13:40	10.23	15.1	2.81	>200	
			13:50	11.88	22.2	3.77	63	
			14:00	11.22	22.0	3.14	105	
			14:10	11.18	20.4	3.08	47	
			14:20	10.29	21.5	3.08	82.3	
			14:30	10.13	23.6	3.11	50	
			14:40	9.94	21.5	3.18	32	
			14:50	9.86	23.0	3.02	29	
			15:00	9.78	23.9	2.94	24	
MW-6S	12/7/93	Centrifugal 6 gallons	10:50	6.50	21.6	2.85	>200	Brown, very silty Well pumps dry quickly
			11:00	6.83	21.4	2.93	>200	
			11:15	7.39	20.3	3.05	>200	
			11:35	7.29	17.9	3.20	>200	
			12:50	7.02	13.9	3.07	>200	
			13:15	7.01	17.7	2.58	>200	
			13:30	7.10	18.6	2.76	>200	
			13:50	7.06	17.6	2.52	>200	

TABLE 2-4 (continued)
PHASE II RI WELL DEVELOPMENT PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date	Pump Type/ Total Gal. Pumped	Time	pH	Temp (°C)	Conductivity (mmhos/cm)	Turbidity (NTU)	Observations
MW-6R	12/7/93	Centrifugal	8:25	7.31	16.4	0.542	>200	Dark brown/gray, silty, odorless
		75 gallons	8:35	7.26	20.1	0.429	>200	
			8:45	7.19	18.8	0.434	>200	
			8:55	7.10	18.6	0.419	83	
			9:05	7.04	19.0	0.410	106.3	
			9:15	7.02	18.4	0.405	>200	
			9:25	6.94	21.4	0.395	>200	
			9:35	6.79	21.5	0.412	113	
			9:45	6.76	16.7	0.431	111	
			9:55	6.96	23.4	0.380	>200	
			10:05	6.50	23.8	0.374	>200	
			10:15	6.48	22.0	0.383	>200	
			10:25	6.47	21.7	0.385	>200	
			10:35	6.48	22.2	0.383	>200	
MW-7S	12/7/93	Centrifugal	14:10	5.10	13.1	1.71	>200	Dark brown, silty, odorless
		65 gallons	14:20	4.53	14.7	2.02	>200	
			14:30	4.40	16.4	2.25	14.3	Clear
			14:40	4.42	15.6	2.11	>200	Surged again
			14:50	4.40	19.3	2.25	18.0	
			15:00	4.44	19.4	2.18	5.5	Clear
			15:10	4.39	19.4	1.98	>200	Surged again
			15:20	4.52	17.2	2.15	15.4	
			15:30	4.50	17.8	1.99	>200	Surged again
			15:40	4.52	17.7	2.07	9.2	
			15:50	4.50	18.7	2.02	4.3	
			16:00	4.52	20.0	2.06	6.3	

TABLE 2-4 (continued)
PHASE II RI WELL DEVELOPMENT PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date	Pump Type/ Total Gal. Pumped	Time	pH	Temp (°C)	Conductivity (mmhos/cm)	Turbidity (NTU)	Observations
MW-8R	12/14/93	Centrifugal 55 gallons	8:30	6.95	14.1	0.881	>200	Grey, silty
			8:45	7.17	15.1	0.889	>200	
			8:55	7.03	15.3	0.788	70	
			9:05	7.01	15.3	0.889	38	
			9:15	7.12	14.8	0.889	17	
			9:25	6.99	14.1	0.785	>200	Surged again
			9:35	7.13	14.2	0.931	>200	
			9:45	7.09	14.0	0.902	NR	
			9:55	7.05	15.1	0.776	NR	
			10:05	6.99	14.4	0.804	NR	Surged again
			10:15	7.02	14.7	0.840	48	
			10:25	7.00	15.2	0.815	31	
			10:35	7.07	16.9	0.854	20	
			10:45	7.09	17.7	0.888	13	
			10:55	7.01	14.8	0.920	12	
MW-9R	12/15/93	Centrifugal 110 gallons	8:00	8.13	11.2	0.786	>200	Dark grey, extremely silty
			8:10	7.36	12.7	1.064	>200	
			8:20	7.25	14.1	1.033	>200	
			8:30	7.24	16.9	1.012	126	
			8:45	7.16	20.9	0.959	79	Clearing
			9:00	7.15	20.8	0.954	60	
			9:10	7.16	19.5	0.845	108	
			9:20	7.19	23.8	0.904	86	
			9:30	7.06	14.1	0.839	171	Increased pump rate
			9:40	6.97	14.2	0.822	105	
			9:50	6.90	14.0	0.791	68	

TABLE 2-4 (continued)
PHASE II RI WELL DEVELOPMENT PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date	Pump Type/ Total Gal. Pumped	Time	pH	Temp (°C)	Conductivity (mmhos/cm)	Turbidity (NTU)	Observations
MW-9R (continued)	12/15/93	Centrifugal 110 gallons	10:00	6.89	14.4	0.780	27	
			10:15	6.85	14.5	0.770	10.8	
			10:25	6.85	14.5	0.766	8.5	
MW-10S	12/6/93	Centrifugal 18 gallons	15:30	7.58	15.0	12.63	>200	Grey, very silty, petroleum odor
			15:40	7.64	18.1	16.25	>200	
			15:50	7.49	18.0	16.62	49	Clearing
			16:00	7.75	18.5	16.29	53	
			16:10	7.81	20.4	15.31	73	
			16:40	8.33	21.5	13.92	91	
			16:50	7.94	21.0	12.94	56.1	
			17:00	8.04	21.7	12.58	97.1	
MW-11S	12/8/93	Centrifugal 110 gallons	7:35	6.44	14.2	18.76	>200	rk grey, silty, strong petroleum od
			7:45	6.49	14.1	14.39	>200	Sheen on water
			7:55	6.48	14.9	14.11	>200	
			8:05	6.40	14.9	13.54	>200	
			8:15	6.41	13.7	13.73	32	
			8:35	6.47	16.4	12.46	3.4	Surged again
			8:45	6.56	16.2	12.68	NR	Battery failure on turbidity meter
			8:55	6.46	16.2	12.26	NR	
			9:05	6.47	16.1	12.86	NR	
			9:15	6.44	19.8	12.26	NR	
			9:25	6.46	16.8	13.14	NR	
			9:35	6.52	16.4	13.42	NR	

TABLE 2-4 (continued)
PHASE II RI WELL DEVELOPMENT PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date	Pump Type/ Total Gal. Pumped	Time	pH	Temp (°C)	Conductivity (mmhos/cm)	Turbidity (NTU)	Observations
MW-11R	12/17/93	Centrifugal	9:30	7.37	17.0	4.69	>200	Brown, very silty, no odor
		70 gallons	9:40	7.14	21.1	3.77	>200	
			9:50	6.83	26.6	3.15	>200	
			10:00	6.82	20.2	2.94	>200	
			10:10	6.73	21.1	3.42	>200	
			10:20	6.90	22.0	3.51	150	Clearing
			10:30	6.91	23.7	3.64	131	
			10:40	6.89	24.9	3.62	106	
			10:50	6.88	25.1	3.59	110	
			11:00	6.97	25.8	3.45	106	
			11:10	6.93	26.2	3.43	110	
			11:20	6.76	23.5	3.54	140	
			11:30	7.02	24.4	4.08	155	
			11:40	6.86	20.2	3.78	159	
			11:50	6.73	21.2	3.89	155	
			12:00	6.87	24.0	4.08	49	Clearing
			12:10	6.84	23.9	3.95	32	
			12:20	6.83	23.5	4.37	38	

Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 2-5
PHASE II RI GROUNDWATER PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date Sampled	pH	Temp (°C)	Conductivity (mmhos/cm)	Turbidity (NTU)	Diss. Oxygen (mg/L)	Salinity (%)	Eh (mV)
MW-1R	01/06/94	7.08	10 1	0 874	224	4 13	0.03	233.1
MW-2S	01/05/94	7.08	10.4	23 3	110	1.84	1 39	194.3
MW-2D	01/05/94	7 79	11 3	11 2	>1000	3 85	0 58	187.5
MW-3S	01/04/94	6.92	9.9	3.22	417	1 81	0 15	129 6
MW-4S	01/04/94	6 39	10.2	1 68	>1000	2 22	0.07	132 1
MW-5S	01/06/94	6.38	14 6	1 08	>1000	3 97	0.02	205 5
MW-6S	01/06/94	7.04	9.6	1 36	>1000	NR	0.05	200.4
MW-6R	01/06/94	6.35	14 4	0.571	>1000	4 99	0 02	184.8
MW-7S	01/04/94	4.54	11 1	1 94	910	1 57	0 09	266.4
MW-8R	01/06/94	7.16	10.0	0 740	598	NR	0 05	199.9
MW-9R	01/06/94	7 16	9 2	0 828	>1000	NR	0.03	195.5
MW-10S	01/06/94	7.33	9 1	16 5	>1000	4 45	0.95	141 7
MW-11S	01/05/94	6 82	5.2	3 56	>1000	NR	NR	129.0
MW-11R	01/05/94	6 99	10.1	14.6	999	4 99	0.61	148.1

Notes·
NR = Value not Recorded
Source· TRC Environmental Corp., Draft Final OFFTA RI Report 1994.

TABLE 2-6
PHASE I AND II RI MONITORING WELL CONSTRUCTION DATA
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Date Installed	Grid Coordinates North	Grid Coordinates East	Ground Elev.(1) (ft. mlw)	Inner Casing Elev.(1) (ft. mlw)	Screen Depth (feet bgs) Top	Screen Depth (feet bgs) Bottom	Screen Elevation (ft. mlw) Top	Screen Elevation (ft. mlw) Bott m
MW-1R	4/26/90	156788.41	547688.43	11.34	11.14	3.50	13.50	7.84	-2.16
MW-2S	4/23/90	156992.61	547441.32	9.07	8.76	4.00	14.00	5.07	-4.93
MW-2D	12/1/93	156995.86	547435.37	9.16	8.56	20.50	30.50	-11.34	-21.34
MW-3S	4/24/90	156914.35	547290.20	9.83	9.61	4.00	14.00	5.83	-4.17
MW-4S	4/24/90	156944.94	546996.66	7.73	7.53	3.00	13.00	4.73	-5.27
MW-5S	4/25/90	156655.70	547366.27	12.47	12.30	8.00	18.00	4.47	-5.53
MW-6S	11/30/93	156498.17	547483.71	13.59	13.39	4.00	9.00	9.59	4.59
MW-6R	12/1/93	156505.80	547504.73	13.81	13.49	16.00	26.00	-2.19	-12.19
MW-7S	11/29/93	156781.40	547262.98	10.91	10.34	3.00	13.00	7.91	-2.09
MW-8R	12/13/93	156750.14	547535.02	12.70	11.90	4.00	14.00	8.70	-1.30
MW-9R	12/14/93	156840.31	547435.91	11.73	11.18	5.00	15.00	6.73	-3.27
MW-10S	11/29/93	156899.69	547579.96	10.35	10.20	4.00	12.00	6.35	-1.65
MW-11S	12/1/93	157055.66	547198.71	7.85	7.70	4.00	9.00	3.85	-1.15
MW-11R	12/16/93	157066.93	547215.37	7.64	7.40	16.00	21.00	-8.36	-13.36

Notes:
mlw - mean low water
bgs - below ground surface
Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.
(1) These wells were resurveyed during the SRE Field investigation. See Table 3-5 for revised elevations.

TABLE 2-7
PHASE II RI STORM SEWER SAMPLE PARAMETERS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Sewer Number	Date Sampled	Time Sampled	pH	Temp (°C)	Conductivity (mmhos/cm)	Observations
ST-1	12/6/93	16:20	6.98	12.0	0.58	Clear water, petroleum sheen and odor
ST-2	12/6/93	15:50	7.08	11.2	6.32	Clear water, petroleum sheen and odor

Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 3-1
PHASE I AND II RI MEASURED GROUND WATER LEVEL ELEVATIONS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Number	Phase I Water Levels			Phase II Water Levels					Average Water Level	Maximum Variation
	6/17/90	09/20/90	1/31/91	1/04/94	2/22/94	5/12/94	07/12/94 High Tide	07/12/94 Low Tide		
MW-1R	5.41	5.27	5.50	4.80	5.32	4.57	4.44	4.45	4.97	1.06
MW-2S	2.89	2.36	4.36	3.56	2.85	3.64	3.74	2.85	3.28	2.00
MW-2D	N/A	N/A	N/A	4.20	3.43	4.20	4.32	2.91	3.81	1.41
MW-3S	3.53	3.74	4.24	4.64	4.27	4.19	3.92	3.85	4.05	1.11
MW-4S	1.80	2.72	3.40	3.36	3.35	3.20	3.35	2.43	2.95	1.60
MW-5S	5.61	5.31	6.02	6.02	6.33	5.76	5.11	5.08	5.66	1.25
MW-6S	N/A	N/A	N/A	6.32	6.93	5.99	5.22	5.21	5.93	1.72
MW-6R	N/A	N/A	N/A	6.26	6.87	6.02	5.22	5.22	5.92	1.65
MW-7S	N/A	N/A	N/A	6.48	NM	5.45	4.83	4.83	5.40	1.65
MW-8R	N/A	N/A	N/A	5.55	5.77	5.36	5.15	5.15	5.64	1.24
MW-9R	N/A	N/A	N/A	5.81	5.71	5.22	4.96	4.96	5.33	0.85
MW-10S	N/A	N/A	N/A	3.90	3.42	3.60	3.74	3.41	3.61	0.49
MW-11S	N/A	N/A	N/A	3.78	3.70	3.52	3.52	3.54	3.61	0.26
MW-11R	N/A	N/A	N/A	3.85	3.50	3.85	3.83	2.89	3.58	0.96

Notes:

N/A: Well not available at this time

NM: Water level not measured; cover frozen.

Elevations relative to Mean Low Water (MLW).

Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 3-2
PHASE I AND II RI MONITORING WELL SLUG TEST ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well I.D.	Type of Test	Screen Depth (ft from ground surface) Top	Bottom	Hydraulic Conductivity (K, ft/day)	Transmissivity (T, ft^2/day)
Wells Screened in Fill/Soil Material					
MW-2S	Rising Head	4.0	14.0	6.1	62
MW-2D	Rising Head	20.5	30.5	0.74	19
MW-4S	Rising Head	3.0	13.0	3.0	24
MW-7S	Rising Head	3.0	13.0	41	350
MW-10S	Rising Head	4.0	12.0	8.4	45
MW-11S	Rising Head	4.0	9.0	120	600
Wells Screened in Bedrock					
MW-6R	Rising Head	16.0	26.0	0.61	NR
MW-8R	Rising Head	4.0	14.0	91	NR
MW-9R	Rising Head	5.0	15.0	21	NR
	Rising Head	5.0	15.0	7.6	NR
MW-11R	Rising Head	16.0	21.0	2.5	NR
MW-11R	Falling Head	16.0	21.0	1.4	NR

Notes:
NR: Not reported: insufficient data to calculate transmissivity in bedrock wells.
* For wells where two slug tests were completed, both analyses are presented.
Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 3-3
PHASE II RI MONITORING WELL VERTICAL HYDRAULIC GRADIENTS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well Cluster I.D	Vertical Distance (feet)(1)					Head Difference (feet) (2)					Gradient (ft/ft)				
	1/4/94	2/22/94	5/12/94	7/12/94	7/12/94	1/4/94	2/22/94	5/12/94	7/12/94	7/12/94	1/4/94 (3)	2/22/94 (4)	5/12/94 High tide	7/12/94 High tide	7/12/94 Low tide
MW-2	19.90	19.19	19.98	20.08	19.19	0.64	0.58	0.56	0.58	0.06	0.0322	0.030	0.028	0.0289	0.0031
MW-6	13.51	14.12	13.18	12.41	12.40	-0.06	-0.06	0.03	0.00	0.01	-0.004	-0.004	0.0023	0	0.0008
MW-11	14.64	14.56	14.53	14.38	14.40	0.07	-0.20	0.42	0.31	-0.65	0.005	-0.014	0.0289	0.0216	-0.0451

Notes:
(1) The vertical distance is the difference in elevation between the water table in the shallow well and the middle of the screened interval in the deep well.
(2) The head difference is the elevation of the deep well piezometric level minus the shallow well water table elevation Thus, negative signs represent downward gradients.
(3) The 1/4/94 levels were measured over a time period between low and high tide within Narragansett Bay.
(4) The 2/22/94 levels were measured over a time period approximately two hours before low tide within Narragansett Bay
The method for calculating vertical hydraulic gradients is explained in Appendix J.

Source TRC Environmental Corp., Draft Final OFFTA RI Report, 1994.

TABLE 3-4
PHASE II RI AVERAGE HORIZONTAL HYDRAULIC GRADIENTS AND LINEAR VELOCITIES
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Location	Average Horizontal Gradients (ft/ft)					Average Linear Velocity (ft/day)				
	01/04/94	02/22/94	05/12/94	07/12/94	07/12/94	01/04/94	02/22/94	05/12/94	07/12/94	07/12/94
Ground Water Flow Direction	(4)	(5)	High Tide	High Tide	Low Tide					
MW-7S to MW-11S(1)	0 0096	N/A	0 0069	0 0047	0 0046	3 1	N/A	2 2	1.5	1.5
MW-9R to MW-2S(2)	0 015	0.0191	0.0105	0 0081	0.0141	0 36	0.46	0 26	0 19	0 34
MW-8R to MW-10S(3)	0 0104	0 0149	0 0111	0 0089	0 0110	0.35	0.50	0 37	0 30	0 37

Notes:

(1). A hydraulic conductivity of 81 ft/day, calculated as an average from K values at MW-7S and MW-11S along with an estimated porosity of 0.25 was used to calculate the average linear velocities

(2) A hydraulic conductivity of 6.1 ft/day, calculated from a K value at MW-2S along with an estimated porosity of 0 25 was used to calculate the average linear velocities (TtNUS)

(3) A hydraulic conductivity of 8.4 ft/day, calculated from a K value at MW-10S along with an estimated porosity of 0.25 was used to calculate the average linear velocities (TtNUS)

(4) The 1/4/94 levels were measured over a time period between low and high tide within Narragansett Bay.

(5) The 2/22/94 levels were measured over a time period approximately two hours before low tide within Narragansett Bay

Source: TRC Environmental Corp., Draft Final OFFTA RI Report, 1994 except for notes 2 and 3 above

TABLE 3-5
SRE GROUNDWATER LEVEL MEASUREMENTS AND ELEVATIONS
JULY 7, 1997 - RISING TIDE
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Well No.	Ground Surface Elev.(1) (ft MLW)	PVC Elev.(1) (ft MLW)	Water Depth (ft bpvc) 07/11/97	Groundwater Elev. (ft MLW) 07/11/97	Comments
MW-1R	11.1	11.35	7.98	3.37	
MW-2D	8.9	8.58	5.57	3.01	
MW-2S	8.9	8.84	6.27	2.57	
MW-3S	9.8	9.97	6.34	3.63	
MW-4S	7.6	7.65	5.25	2.40	
MW-5S	12.3	12.27	3.62	8.65	water depth measurement error
MW-6R	13.6	13.45	9.00	4.45	
MW-6S	13.6	13.50	8.60	4.90	
MW-7S	10.8	10.38	5.55	4.83	
MW-8R	12.5	12.19	7.36	4.83	
MW-9R	10.9	11.19	6.40	4.79	
MW-10S	9.9	10.24	7.31	2.93	
MW-11R	7.6	7.42	4.68	2.74	
MW-11S	7.6	7.77	4.53	3.24	
MW-101	9.4	9.19	5.70	3.49	
MW-102	8.3	8.47	6.34	2.13	

Notes: Water level measurements made from 0720 to 0846 on 07/11/97; low tide at 0600
bpvc below PVC
MLW mean low water

(1) Source: B&R Environmental, SRE Report, January 1998. (Existing and newly installed wells were surveyed during the SRE field investigation.)

TABLE 4-1
SURFACE SOILS ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	Surface Soil Background Conc	# > Surface Soil Bkgnd	RIDEM Direct Exposure Residential	# > RIDEM Direct Exp Res	RIDEM GB Leachability	# > RIDEM GB Leach
SURFACE SOILS - VOLATILE ORGANIC COMPOUNDS														
1,1,1-TRICHLOROETHANE	UG/KG	1 / 67	3 9	2	2 J	2 J	OFF-SS-23	11/04/93			540000	0	160000	0
1,2-DICHLOROETHENE (TOTAL)	UG/KG	1 / 67	4 2	17	17	17	OFF-B-14-1	12/13/93			630000	0	60000	0
2-BUTANONE	UG/KG	15 / 67	6 2	6 7	1 J	13	OFF-SS-306	11/18/98			10000000	0		
2-HEXANONE	UG/KG	1 / 67	6	32	32	32	OFF-SS-330	11/18/98						
ACETONE	UG/KG	23 / 67	57	110	2	320 J	OFF-SS-325	11/19/98			7800000	0		
BROMOMETHANE	UG/KG	2 / 67	4 3	1	1 J	1 J	OFF-SS-315, OFF-SS-318	11/20/98, 11/19/98			800	0		
CARBON DISULFIDE	UG/KG	1 / 67	4 1	2	2 J	2 J	OFF-SS-314	11/19/98						
CHLOROMETHANE	UG/KG	3 / 67	4 3	1	1 J	1 J	OFF-SS-304, OFF-SS-305, OFF-SS-332	11/20/98, 11/20/98, 11/20/98						
METHYLENE CHLORIDE	UG/KG	37 / 67	3 6	2 3	1 J	4 J	OFF-SS-324	11/19/98			45000	0		
TETRACHLOROETHENE	UG/KG	3 / 67	4 1	6 3	1 J	16	OFF-B-10-1	11/23/93			12000	0	4200	0
TOLUENE	UG/KG	5 / 67	3 7	2 4	2 J	4 J	OFF-SS-312	11/19/98			190000	0	54000	0
TOTAL XYLENES	UG/KG	6 / 67	3 6	2 2	1 J	3 J	OFF-SS-14, OFF-SS-17	11/03/93, 11/03/93			110000	0		
TRICHLOROETHENE	UG/KG	1 / 67	3 9	1	1 J	1 J	OFF-SS-17	11/03/93			13000	0	20000	0
VINYL CHLORIDE	UG/KG	1 / 67	4 1	3	3 J	3 J	OFF-B-14-1	12/13/93			20	0		
SURFACE SOILS - SEMI-VOLATILE ORGANIC COMPOUNDS RESULTS														
2-METHYLNAPHTHALENE	UG/KG	9 / 71	320	190	41 J	660	OFF-M-101	11/29/93			123000	0		
4-CHLORO-3-METHYLPHENOL	UG/KG	3 / 71	320	100	68 J	140 J	OFF-SS-326	11/19/98						
9H-CARBAZOLE	UG/KG	7 / 33	200	230	56	690	OFF-B-13-1	11/23/93						
ACENAPHTHENE	UG/KG	12 / 71	290	340	46 J	940	OFF-SS6	04/11/90			43000	0		
ACENAPHTHYLENE	UG/KG	6 / 71	310	64	37 J	140 J	OFF-B-12-1	11/24/93			23000	0		
ANTHRACENE	UG/KG	21 / 71	370	560	42 J	3800	OFF-SS-314	11/19/98			35000	0		
BENZO(A)ANTHRACENE	UG/KG	43 / 71	490	660	42 J	9100	OFF-SS-314	11/19/98			900	7		
BENZO(A)PYRENE	UG/KG	42 / 71	470	640	41 J	7100	OFF-SS-314	11/19/98			400	12		
BENZO(B)FLUORANTHENE	UG/KG	52 / 71	540	660	36 J	9700	OFF-SS-314	11/19/98			900	9		
BENZO(G,H,I)PERYLENE	UG/KG	29 / 71	310	450	41 J	4300	OFF-SS-314	11/19/98			800	6		
BENZO(K)FLUORANTHENE	UG/KG	15 / 71	310	690	64 J	3500 J	OFF-SS-314	11/19/98			900	3		
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	15 / 71	340	310	42	3200 J	OFF-SS-332	11/20/98			46000	0		
CARBAZOLE	UG/KG	9 / 65	290	300	40	930 J	OFF-SS-314	11/19/98						
CHRYSENE	UG/KG	46 / 71	460	580	37 J	8100	OFF-SS-314	11/19/98			400	11		
DI-N-BUTYLPHTHALATE	UG/KG	17 / 71	290	75	38 J	170 J	OFF-SS-19	11/03/93						
DI-N-OCTYLPHTHALATE	UG/KG	1 / 71	320	54	54 J	54 J	OFF-M-101	11/29/93						
DIBENZO(A,H)ANTHRACENE	UG/KG	11 / 71	300	180	42 J	610	OFF-B-12-1	11/24/93			400	1		
DIBENZOFURAN	UG/KG	8 / 71	290	290	39	650	OFF-SS6	04/11/90						
FLUORANTHENE	UG/KG	56 / 71	790	950	38 J	15000	OFF-SS-314	11/19/98			20000	0		
FLUORENE	UG/KG	13 / 71	300	370	49 J	1200	OFF-SS6	04/11/90			28000	0		

TABLE 4-1 (continued)
SURFACE SOILS ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	Surface Soil Background Conc	# > Surface Soil Bkgnd	RIDEM Direct Exposure Residential	# > RIDEM Direct Exp Res	RIDEM GB Leachability	# > RIDEM GB Leach
HEXACHLOROBENZENE	UG/KG	2 / 71	320	130	43 J	210 J	OFF-B-18-1	11/23/93			400	0		
INDENO(1,2,3-CD)PYRENE	UG/KG	30 / 71	310	430	42 J	4100	OFF-SS-314	11/19/98			900	4		
N-NITROSO-DIPHENYLAMINE	UG/KG	1 / 71	320	150	150 J	150 J	OFF-B-12-1	11/24/93						
NAPHTHALENE	UG/KG	7 / 71	320	260	39 J	740	OFF-SS-20	11/03/93			54000	0		
PENTACHLOROPHENOL	UG/KG	1 / 71	850	350	350	350	OFF-B-16-1	11/23/93			5300	0		
PHENANTHRENE	UG/KG	45 / 71	650	900	43 J	9700	OFF-SS-314	11/19/98			40000	0		
PHENOL	UG/KG	1 / 71	320	60	60 J	60 J	OFF-M-81	11/30/93			6000000	0		
PYRENE	UG/KG	59 / 71	740	850	40 J	12000	OFF-SS-314	11/19/98			13000	0		
SURFACE SOILS - PESTICIDES/PCBS RESULTS														
4,4'-DDD	UG/KG	21 / 39	4 6	5 7	0 82 J	17	OFF-B-16-1	11/23/93						
4,4'-DDE	UG/KG	36 / 39	9 3	9 5	0 41 J	42	OFF-SS-17	11/03/93						
4,4'-DDT	UG/KG	36 / 39	17	18	2 3 J	74	OFF-SS-17	11/03/93						
ALDRIN	UG/KG	3 / 39	4 3	0 55	0 059 J	1 5 J	OFF-SS-15	11/03/93						
ALPHA-BHC	UG/KG	4 / 39	1 4	0 98	0 048 J	1 7 J	OFF-SS-23	11/04/93						
ALPHA-CHLORDANE	UG/KG	14 / 39	6 1	2 6	0 33 J	14	OFF-SS-18	11/03/93						
AROCLOR-1254	UG/KG	2 / 39	40	300	80	530	OFF-M-101	11/29/93			10000	0	10000	0
BETA-BHC	UG/KG	3 / 39	1 4	0 57	0 27 J	0 99 J	OFF-SS-17	11/03/93						
DIELDRIN	UG/KG	17 / 39	4 7	2 8	0 47 J	11 J	OFF-SS-18	11/03/93			40	0		
ENDOSULFAN I	UG/KG	7 / 39	1 6	2 9	0 35 J	9 4	OFF-B-16-1	11/23/93						
ENDOSULFAN II	UG/KG	18 / 39	4	4 5	0 024 NJ	25	OFF-B-16-1	11/23/93						
ENDOSULFAN SULFATE	UG/KG	11 / 39	3 9	4 2	0 3 NJ	33	OFF-B-16-1	11/23/93						
ENDRIN	UG/KG	27 / 39	8 1	8 2	0 59 NJ	74	OFF-B-16-1	11/23/93						
ENDRIN ALDEHYDE	UG/KG	18 / 33	6 1	7 4	1 4 NJ	25 NJ	OFF-M-101	11/29/93						
ENDRIN KETONE	UG/KG	1 / 39	2 9	2 9	2 9 J	2 9 J	OFF-SS-12	11/03/93						
GAMMA-BHC	UG/KG	9 / 39	1 5	0 68	0 054 NJ	2 4	OFF-M-91	12/01/93						
GAMMA-CHLORDANE	UG/KG	13 / 39	5 6	1 6	0 076 NJ	7 8	OFF-SS-18	11/03/93						
HEPTACHLOR	UG/KG	3 / 39	1 6	0 58	0 27 J	0 74 , J	OFF-SS-21, OFF-SS-27	11/04/93, 11/04/93						
HEPTACHLOR EPOXIDE	UG/KG	24 / 39	2 1	1 4	0 06 NJ	8 1	OFF-B-16-1	11/23/93						
METHOXYCHLOR	UG/KG	8 / 39	14	4 8	1 4 J, NJ	10 J	OFF-B-18-1	11/23/93						
SURFACE SOILS - METALS RESULTS														
ALUMINUM	MG/KG	76 / 76	8820	8820	1480	12200	OFF-SS-306	11/18/98	11900	2				
ANTIMONY	MG/KG	10 / 76	2 1	3 7	0 58 J	9 1 J	OFF-M-111	11/29/93	0 67	6	10	0		
ARSENIC	MG/KG	76 / 76	6	6	1 5	10 4	OFF-SS-325	11/19/98	5 55	49	1 7	73		
BARIUM	MG/KG	72 / 76	26 7	28 1	8	282	OFF-M-111	11/29/93	38 5	3	5500	0		
BERYLLIUM	MG/KG	60 / 76	0 33	0 37	0 22 J	0 6	OFF-SS-305	11/20/98	0 439	10	0 4	18		
CADMIUM	MG/KG	3 / 76	0 24	0 83	0 72	0 94	OFF-SS4	04/11/90	0 7	3	39	0		
CALCIUM	MG/KG	63 / 76	1470	1690	325	21000	OFF-SS4	04/11/90	1220	21				
CHROMIUM	MG/KG	76 / 76	12 6	12 6	1 7	37 9	OFF-SS-313	11/19/98	20 2	5	1400	0		

TABLE 4-1 (continued)
SURFACE SOILS ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	Surface Soil Background Conc	# > Surface Soil Bkgnd	RIDEM Direct Exposure Residential	# > RIDEM Direct Exp Res	RIDEM GB Leachability	# > RIDEM GB Leach
COBALT	MG/KG	67 / 76	6 8	7 5	2 4	20	OFF-SS6	04/11/90	9 01	18				
COPPER	MG/KG	75 / 76	20 6	20 9	2 4 J	220	OFF-M-111	11/29/93	23 8	12	3100	0		
IRON	MG/KG	76 / 76	17800	17800	4030	107000	OFF-SS-313	11/19/98	23200	8				
LEAD	MG/KG	75 / 76	80 1	81 1	2 9	2970	OFF-M-111	11/29/93	48 8	17	150	2		
MAGNESIUM	MG/KG	76 / 76	2190	2190	555	7340	OFF-SS4	04/11/90	2240	31				
MANGANESE	MG/KG	76 / 76	267	267	77 5	750	OFF-SS6	04/11/90	372	12	390	11		
MERCURY	MG/KG	32 / 76	0 066	0 11	0 05 J	0 61	OFF-SS-18	11/03/93	0 189	3	23	0		
NICKEL	MG/KG	66 / 76	15 1	16 6	2 2 J	221	OFF-M-111	11/29/93	17 4	13	1000	0		
POTASSIUM	MG/KG	68 / 76	365	394	168	1270	OFF-SS-303	11/18/98	312	42				
SELENIUM	MG/KG	8 / 76	0 31	0 58	0 46	0 66 J	OFF-SS-317	11/19/98			390	0		
SILVER	MG/KG	22 / 76	2 2	5 9	0 68	26 5 J	OFF-SS-313	11/19/98			200	0		
SODIUM	MG/KG	7 / 76	130	352	49	907	OFF-SS6	04/11/90						
VANADIUM	MG/KG	76 / 76	16 7	16 7	3 8	41 2	OFF-B-10-1	11/23/93	22 6	5	550	0		
ZINC	MG/KG	75 / 76	98 4	99 4	13 4	1910 J	OFF-M-111	11/29/93	225	4	6000	0		
SURFACE SOILS - DIOXINS/FURANS RESULTS														
TOTAL 2,3,7,8-TCDD EQUIVALENTS	UG/KG	7 / 7	0 00752	0 00752	0 000751	0 016388	OFF-SS-308	11/20/98						

TABLE 4-2
SUBSURFACE SOIL ANALYSIS RESULTS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det. Freq.	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	Subsurface Soil Background Conc	# > Subsurf. Soil Bkgnd.	RIDEM Direct Exposure Residential	# > RIDEM Direct Exp. Res	RIDEM GB Leachability	# > RIDEM GB Leach.
SUBSURFACE SOILS - METALS RESULTS														
ALUMINUM	MG/KG	50 / 50	8700	8700	3030	20700	OFF-M-72	11/29/93	15800	1				
ANTIMONY	MG/KG	9 / 39	4	10 8	4 J	39.2 J	OFF-TP-13	07/03/97	0.42	9	10	3		
ARSENIC	MG/KG	50 / 50	8 7	8 7	1 3 J*	74 4 J	OFF-TP-16	07/07/97	42 8	2	1 7	48		
BARIUM	MG/KG	50 / 50	40 5	40 5	4.9	220	OFF-MW-102	07/07/97	21.3	29	5500	0		
BERYLLIUM	MG/KG	23 / 39	0 24	0 31	0.2	0 48 B1	MW-3	04/24/90	1 1	0	0 4	2		
CADMIUM	MG/KG	11 / 38	0 92	2 3	0 25 J	8 1	MW-2	04/23/90			39	0		
CALCIUM	MG/KG	50 / 50	6280	6280	523	91300	B-1	04/18/90	1080	36				
CHROMIUM	MG/KG	50 / 50	14 1	14 1	5 4	61.9	OFF-TP-16	07/07/97	24 1	2	1400	0		
COBALT	MG/KG	50 / 50	10.4	10 4	2 8	20 5 J*	B-6	04/19/90	20 3	1				
COPPER	MG/KG	49 / 50	112	114	6.1	2310	OFF-MW-102	07/07/97	30 9	23	3100	0		
IRON	MG/KG	50 / 50	34100	34100	5230	204000	OFF-MW-102	07/07/97	46400	6				
LEAD	MG/KG	49 / 49	564	564	2 2 J*	7820 J	OFF-TP-13	07/03/97	15 4	39	150	17		
MAGNESIUM	MG/KG	50 / 50	3220	3220	602 J*	7770	OFF-MW-102	07/07/97	5310	2				
MANGANESE	MG/KG	50 / 50	398	398	70 7	1110 J	OFF-TP-16	07/07/97	563	9	390	23		
MERCURY	MG/KG	26 / 37	0 19	0 26	0 06 J	2.2 J	OFF-TP-16	07/07/97			23	0		
NICKEL	MG/KG	50 / 50	20	20	4.3 B	64 1	OFF-MW-102	07/07/97	34.5	3	1000	0		
POTASSIUM	MG/KG	41 / 50	425	479	184	1030 B	OFF-B-15-3	12/13/93	539	11				
SELENIUM	MG/KG	18 / 40	0.47	0.75	0 39 J*	1.7 B1	MW-3	04/24/90			390	0		
SODIUM	MG/KG	33 / 50	508	730	56 6	3820	B-5	04/17/90						
VANADIUM	MG/KG	47 / 50	16 7	17 5	7 4 B	57	OFF-M-72	11/29/93	26	2	550	0		
ZINC	MG/KG	47 / 50	468	496	23.6 J*	4240	OFF-TP-16	07/07/97	175	13	6000	0		
SUBSURFACE SOILS - SEMI-VOLATILE ORGANIC COMPOUNDS RESULTS														
2-METHYLNAPHTHALENE	UG/KG	13 / 35	1100	1800	77 J	11000	OFF-MW-101	07/09/97			123000	0		
4,6-DINITRO-2-METHYLPHENOL	UG/KG	1 / 32	1200	320	320 J	320 J	OFF-B-15-2	12/13/93						
9H-CARBAZOLE	UG/KG	6 / 12	190	150	69 J	220 J	OFF-B-15-3	12/13/93						
ACENAPHTHENE	UG/KG	14 / 37	670	780	100 J	4900	OFF-TP-15	07/03/97			43000	0		
ACENAPHTHYLENE	UG/KG	10 / 33	480	190	47 J	640	OFF-B-8-2	11/22/93			23000	0		
ANTHRACENE	UG/KG	32 / 43	560	610	41 J	4800	OFF-MW-102	07/07/97			35000	0		
BENZO(A)ANTHRACENE	UG/KG	35 / 43	790	750	52 J	3400	OFF-MW-102	07/07/97			900	10		
BENZO(A)PYRENE	UG/KG	32 / 42	820	730	77 J	4000	OFF-MW-102	07/07/97			400	17		
BENZO(B)FLUORANTHENE	UG/KG	34 / 42	740	760	47 J	2800	OFF-B-8-2	11/22/93			900	9		
BENZO(G,H,I)PERYLENE	UG/KG	22 / 39	570	440	57 J	1900 J	OFF-MW-102	07/07/97			800	2		
BENZO(K)FLUORANTHENE	UG/KG	22 / 43	560	620	62 J	2500 J	OFF-TP3-2	01/11/94			900	3		
BENZOIC ACID	UG/KG	1 / 2	500	48	48 J	48 J	MW-3	04/24/90						

TABLE 4-2 (continued)
SUBSURFACE SOIL ANALYSIS RESULTS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect.	Subsurface Soil Background Conc.	# > Subsurf Soil Bkgnd	RIDEM Direct Exposure Residential	# > RIDEM Direct Exp. Res	RIDEM GB Leachability	# > RIDEM GB Leach.
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	3 / 44	420	70	44 J	110 J	OFF-M-112	11/29/93			46000	0		
BUTYLBENZYLPHTHALATE	UG/KG	1 / 33	490	120	120 J	120 J	OFF-B-15-3	12/13/93						
CARBAZOLE	UG/KG	1 / 21	640	170	170 J	170 J	OFF-TP-05	07/01/97						
CHRYSENE	UG/KG	37 / 43	790	720	51 J	3200 J	OFF-MW-102	07/07/97			400	21		
DI-N-BUTYLPHTHALATE	UG/KG	3 / 40	450	530	56 J	1400 *	B-3	04/20/90						
DIBENZO(A,H)ANTHRACENE	UG/KG	19 / 37	460	220	60 J	820 J	OFF-MW-102	07/07/97			400	2		
DIBENZOFURAN	UG/KG	11 / 34	680	820	86 J	4000	OFF-TP-15	07/03/97						
FLUORANTHENE	UG/KG	43 / 47	1500	1600	39 J	16000	OFF-MW-102	07/07/97			20000	0		
FLUORENE	UG/KG	17 / 36	660	830	120 , J	3400	OFF-TP-11	07/02/97			28000	0		
HEXACHLOROBENZENE	UG/KG	1 / 33	490	370	370 J	370 J	OFF-B-14-2	12/13/93			400	0		
INDENO(1,2,3-CD)PYRENE	UG/KG	29 / 39	620	450	48 J	2300 J	OFF-MW-102	07/07/97			900	2		
NAPHTHALENE	UG/KG	10 / 34	710	980	41 J	4000	OFF-TP-11	07/02/97			54000	0		
PHENANTHRENE	UG/KG	43 / 47	2100	2200	38 J	14000	MW-2, OFF-TP-15	04/23/90, 07/03/97			40000	0		
PHENOL	UG/KG	3 / 22	590	410	250 J	490	B-7, MW-2	04/19/90, 04/23/90			6000000	0		
PYRENE	UG/KG	45 / 49	1300	1300	70 J	5300	OFF-MW-102	07/07/97			13000	0		
TOTAL BNA'S	UG/KG	8 / 8	6300	6300	48	20890	MW-2	04/23/90						
TOTAL CARCINOGENIC PAH'S	UG/KG	4 / 4	2200	2200	135	3950	B-3	04/18/90						
TOTAL PAH	UG/KG	16 / 16	5900	5900	82	21100	MW-2	04/23/90						
SUBSURFACE SOILS - VOLATILE ORGANIC COMPOUNDS RESULTS														
2-BUTANONE	UG/KG	3 / 37	100	400	3 J	1100 J	MW-2	04/23/90			10000000	0		
CARBON DISULFIDE	UG/KG	3 / 38	70	8	3 J	11	B-5	04/17/90						
CHLOROETHANE	UG/KG	1 / 35	75	1	1 J	1 J	OFF-B-14-2	12/13/93						
ETHYLBENZENE	UG/KG	3 / 37	94	290	89	630 J	OFF-MW-102	07/07/97			71000	0	62000	0
METHYLENE CHLORIDE	UG/KG	6 / 53	180	330	1 J	1800	OFF-TP-11	07/02/97			45000	0		
TOLUENE	UG/KG	10 / 39	69	9 1	1 J	67	B-6	04/19/90			190000	0	54000	0
TOTAL VOC'S	UG/KG	3 / 3	2	2	1	3	B-2	04/18/90						
TOTAL XYLENES	UG/KG	5 / 37	100	240	2 J	1200	B-6	04/19/90			110000	0		
SUBSURFACE SOILS - PESTICIDES/PCBS RESULTS														
4,4'-DDD	UG/KG	5 / 33	6 8	32	9.1 J	89 J	OFF-TP3-3	01/12/94						
4,4'-DDE	UG/KG	8 / 33	5.2	15	0 13 J	67 J	OFF-M-112	11/29/93						
4,4'-DDT	UG/KG	11 / 33	20	55	0 61 J	370	OFF-M-112	11/29/93						
ALPHA-BHC	UG/KG	4 / 33	1 2	1 1	0 045 J	2 5 J	OFF-M-112	11/29/93						
ALPHA-CHLORDANE	UG/KG	2 / 33	1 5	7 4	4 8 J	10 NJ	OFF-M-112	11/29/93						
AROCLOR-1254	UG/KG	2 / 33	37	140	95 J	190 J	OFF-B-15-3	12/13/93			10000	0	10000	0

TABLE 4-2 (continued)
SUBSURFACE SOIL ANALYSIS RESULTS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	Subsurface Soil Background Conc	# > Subsurf. Soil Bkgnd.	RIDEM Direct Exposure Residential	# > RIDEM Direct Exp Res	RIDEM GB Leachability	# > RIDEM GB Leach
AROCLOR-1260	UG/KG	1 / 33	30	39	39 J	39 J	OFF-B-17-2	11/24/93			10000	0	10000	0
DELTA-BHC	UG/KG	1 / 33	1 5	2 4	2 4 J	2 4 J	OFF-TP3-1	01/11/94						
DIELDRIN	UG/KG	2 / 33	5 8	23	1.5 NJ	44 J	OFF-M-112	11/29/93			40	1		
ENDOSULFAN I	UG/KG	3 / 33	1 9	4 6	4 J	5 4 J	OFF-TP3-3	01/12/94						
ENDOSULFAN II	UG/KG	12 / 33	3 8	5.4	0 3 NJ	13 J	OFF-B-16-2	11/23/93						
ENDOSULFAN SULFATE	UG/KG	3 / 33	3.4	7 3	1 1 NJ	17 J	OFF-B-16-2	11/23/93						
ENDRIN	UG/KG	6 / 33	9	36	5.3 J	120 J	OFF-M-112	11/29/93						
ENDRIN ALDEHYDE	UG/KG	3 / 33	14	12	5.2 J	16 J	OFF-M-102	11/29/93						
GAMMA-BHC	UG/KG	3 / 33	1.4	2.1	0 28 J	3.1 NJ	OFF-M-112	11/29/93						
GAMMA-CHLORDANE	UG/KG	3 / 33	1.6	1.5	0 062 NJ	2 5 J	OFF-B-15-3	12/13/93						
HEPTACHLOR	UG/KG	1 / 33	1 5	1 4	1 4 J	1 4 J	OFF-B-15-3	12/13/93						
HEPTACHLOR EPOXIDE	UG/KG	10 / 33	3	7.3	0.89 J	43	OFF-M-112	11/29/93						
METHOXYCHLOR	UG/KG	1 / 33	15	4	4 NJ	4 NJ	OFF-B-13-2	11/23/93						
SUBSURFACE SOILS - TOTAL PETROLEUM HYDROCARBONS RESULTS														
TPH	MG/KG	11 / 14	4400	5600	130 J	21000 J	OFF-TP-15	07/03/97			500	8	2500	7

TABLE 4-3
GROUNDWATER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

PARAMETER	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Maximum Detected	RIDEM GB GW Objective	# > RIDEM GB GW Objective	Max Upgr. GW (unfiltered)	# > Max Upgr GW (unfilt)	Max Upgr GW (filtered)	# > Max Upgr GW (filt)
GROUNDWATER - VOLATILE ORGANIC COMPOUNDS RESULTS														
BENZENE	UG/L	2 / 24	6 3	20	8 J	33	MW-102	07/11/97	140	0				
CARBON DISULFIDE	UG/L	1 / 24	4 8	1	1 J	1 J	MW-2-D	01/05/94						
CHLOROFORM	UG/L	1 / 25	4 9	2	2 J	2 J	MW-1	07/19/90						
ETHYLBENZENE	UG/L	1 / 24	6 4	38	38	38	MW-102	07/11/97	1600	0				
GROUNDWATER - SEMI-VOLATILE ORGANIC COMPOUNDS RESULTS														
2-METHYLNAPHTHALENE	UG/L	2 / 24	13	97	3 J	190	MW-101	07/11/97						
ACENAPHTHENE	UG/L	7 / 26	5 7	7 4	1 J	24 J*	MW-2-S	07/19/90						
ANTHRACENE	UG/L	3 / 25	5 1	5	3 J	9 J	MW-2-S	07/19/90						
BENZO(A)ANTHRACENE	UG/L	3 / 25	4 7	1 5	0 7 J	3	MW-2-S	07/19/90						
BENZO(A)PYRENE	UG/L	3 / 25	4 6	1.2	0 7	2 J	MW-2-S	07/19/90						
BENZO(B)FLUORANTHENE	UG/L	3 / 25	4 6	0 73	0 5	1 J	MW-2-S	07/19/90						
BENZO(G,H,I)PERYLENE	UG/L	1 / 24	4 9	0 8	0 8 J	0 8 J	MW-2-S	01/05/94						
BENZO(K)FLUORANTHENE	UG/L	2 / 24	4 7	0 7	0.6	0.8 J	MW-2-S	01/05/94						
BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	6 / 27	37	140	0.5 J	740	MW-2-S	07/19/90						
CARBAZOLE	UG/L	2 / 24	4 8	1 5	1 J	2 J	MW-101	07/11/97						
CHRYSENE	UG/L	3 / 25	4 7	2	0.9	4 J	MW-2-S	07/19/90						
DI-N-BUTYLPHTHALATE	UG/L	4 / 25	4.5	1.2	0.9 J	2 J	MW-1	01/06/94						
DIBENZOFURAN	UG/L	3 / 25	4 9	3.7	1 J	8 J	MW-101	07/11/97						
DIETHYLPHTHALATE	UG/L	1 / 24	4.9	0 6	0 6 J	0 6 J	MW-10-S	01/06/94						
FLUORANTHENE	UG/L	4 / 25	4.7	2 8	1 J	6 J	MW-2-S	07/19/90						
FLUORENE	UG/L	5 / 26	5 5	7	1 J	21 J*	MW-2-S	07/19/90						
INDENO(1,2,3-CD)PYRENE	UG/L	1 / 24	4.9	0 7	0.7 J	0.7 J	MW-2-S	01/05/94						
NAPHTHALENE	UG/L	3 / 24	11	54	0 6 J	150	MW-101	07/11/97						
PHENANTHRENE	UG/L	5 / 25	6.6	13	0 8 J	44 J*	MW-2-S	07/19/90						
PHENOLS	UG/L	2 / 13	4 8	3.5	2 J	5 J	MW-11-R	07/10/97						
PYRENE	UG/L	4 / 25	5.6	8 2	1 J	23	MW-2-S	07/19/90						
GROUNDWATER - PESTICIDE/PCB RESULTS														
ENDRIN	UG/L	1 / 22	0 051	0 05	0 05 J	0.05 J	MW-8-R	01/06/94						
GROUNDWATER - TOTAL PETROLEUM HYDROCARBONS RESULTS														
TOTAL PETROLEUM HYDROCARBONS	MG/L	0 / 13	0 51	0	0	0	None							
GROUNDWATER - TOTAL METALS RESULTS														
ALUMINUM	UG/L	22 / 29	3320000	4380000	248	44600000 J*	MW-3	07/19/90			82500	6		
ANTIMONY	UG/L	2 / 25	498	36 6	35 7	37 5 B	MW-2-S	01/05/94			27	2		
ARSENIC	UG/L	14 / 27	879	1690	2 1 B	16600 J*	MW-2-S	07/19/90			16 5	9		
BARIUM	UG/L	28 / 29	32600	33800	5 3	569000	MW-2-S	07/19/90			144	9	23 1	22
BERYLLIUM	UG/L	9 / 25	97	269	1 B	2400	MW-3	07/19/90			2 6	4		
CADMIUM	UG/L	12 / 25	1950	4070	0 7	48800	MW-2-S	07/19/90			0 7	11		
CALCIUM	UG/L	29 / 29	15200000	15200000	16200 J	189000000	MW-2-S	07/19/90			84300	18	30600	27
CHROMIUM	UG/L	27 / 29	4900	5260	3 2	47000 J*	MW-3	07/19/90			113	6		
COBALT	UG/L	23 / 29	5150	6070	3 5 B	50000 J*	MW-3	07/19/90			111	6	28 2	13

TABLE 4-3 (continued)
GROUNDWATER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

PARAMETER	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Maximum Detected	RIDEM GB GW Objective	# > RIDEM GB GW Objective	Max Upgr. GW (unfiltered)	# > Max Upgr. GW (unfilt)	Max Upgr. GW (filtered)	# > Max Upgr. GW (filt)
COPPER	UG/L	19 / 29	43300	65800	11 4 B	1030000 J*	MW-2-S	07/19/90			120	9		
CYANIDE	UG/L	1 / 1	23300	23300	23300	23300	MW-3	07/19/90						
IRON	UG/L	28 / 29	13100000	13600000	934 J	157000000	MW-3	07/19/90			206000	6	260	28
LEAD	UG/L	25 / 29	160000	186000	1 6 J	4120000 J*	MW-2-S	07/19/90			59	12		
MAGNESIUM	UG/L	29 / 29	19000000	19000000	9590 J	414000000	MW-2-S	07/19/90			32300	21	23400	22
MANGANESE	UG/L	29 / 29	898000	898000	291 J	8720000	MW-4	07/19/90			4420	14	2760	18
MERCURY	UG/L	10 / 26	131	340	0.02 J	2100	MW-2-S	07/19/90						
NICKEL	UG/L	9 / 29	8120	18000	21.5 B	81500 J*	MW-2-S	07/19/90			170	4		
POTASSIUM	UG/L	29 / 29	8530000	8530000	3980 B	199000000	MW-2-S	07/19/90			14800	21	7780	25
SILVER	UG/L	9 / 28	494	1 4	0 4 B	3 6	MW-10-S	01/06/94			0 6	8		
SODIUM	UG/L	28 / 29	31200000	32300000	41700	419000000	MW-3	07/19/90			175000	19	134000	20
VANADIUM	UG/L	13 / 29	459000	1020000	0 59 J	12400000	MW-2-S	07/19/90			46 6	3		
ZINC	UG/L	19 / 27	13600	19300	8	130000	MW-5	07/19/90			380	11		
GROUNDWATER - DISSOLVED METALS RESULTS														
ALUMINUM	UG/L	4 / 8	578	1150	25.7 J	4470	MW-7-S	01/04/94			82500	0		
ANTIMONY	UG/L	2 / 8	38 8	134	55.1 B	212	MW-7-S	01/04/94			27	2		
ARSENIC	UG/L	2 / 8	4 7	16	3.8 J	28 3	MW-101	07/11/97			16 5	1		
BARIUM	UG/L	7 / 8	186	213	11	890	MW-7-S	01/04/94			144	3	23.1	4
BERYLLIUM	UG/L	1 / 8	2 9	21 3	21.3	21 3	MW-7-S	01/04/94			2.6	1		
CADMIUM	UG/L	3 / 8	1 1	2 6	0.6 J	6 3 J	MW-7-S	01/04/94			0 7	2		
CALCIUM	UG/L	8 / 8	72300	72300	15900 J	143000	MW-2-D	01/05/94			84300	3	30600	7
CHROMIUM	UG/L	3 / 8	12 4	31 9	3 2 B	88 7	MW-7-S	01/04/94			113	0		
COBALT	UG/L	2 / 8	31 8	123	33 6 B	212	MW-7-S	01/04/94			111	1	28.2	2
COPPER	UG/L	4 / 8	18 9	36 2	3.2 B	129	MW-7-S	01/04/94			120	1		
IRON	UG/L	6 / 8	3010	4010	139 J	16000 J	MW-7-S	01/04/94			206000	0	260	5
LEAD	UG/L	1 / 7	3 3	18 3	18.3	18 3	MW-7-S	01/04/94			59	0		
MAGNESIUM	UG/L	8 / 8	96000	96000	8410 J	299000 J	MW-2-S	01/05/94			32300	5	23400	5
MANGANESE	UG/L	8 / 8	4750	4750	269 J	25700 J	MW-4-S	01/04/94			4420	2	2760	2
MERCURY	UG/L	1 / 8	0.035	0 02	0 02	0.02	MW-101	07/11/97						
NICKEL	UG/L	3 / 8	45.9	118	17 9 B	215	MW-7-S	01/04/94			170	1		
POTASSIUM	UG/L	8 / 8	124000	124000	5400	697000	MW-2-D	01/05/94			14800	5	7780	6
SILVER	UG/L	1 / 8	0 45	1 8	1 8 J	1 8 J	MW-102	07/11/97			0 6	1		
SODIUM	UG/L	8 / 8	779000	779000	39100 J	2340000 J	MW-103	07/11/97			175000	6	134000	6
VANADIUM	UG/L	2 / 8	32 1	125	9 9 J	240	MW-7-S	01/04/94			46.6	1		
ZINC	UG/L	1 / 8	52.3	395	395 J	395 J	MW-7-S	01/04/94			380	1		
GROUNDWATER - WATER QUALITY PARAMETERS RESULTS														
BIOCHEMICAL OXYGEN DEMAND	MG/L	5 / 5	3 8	3 8	2	6	MW-2-S, MW-7-S	01/05/94, 01/04/94						
CHEMICAL OXYGEN DEMAND	MG/L	5 / 5	124	124	25.6	444	MW-2-S	01/05/94						
CHLORIDE	UG/L	11 / 11	1390	1390	79 8	4740	MW-2-S	01/05/94			481	7		
TOTAL SUSPENDED SOLIDS	MG/L	5 / 5	248	248	10	670	MW-4-S	01/04/94						

TABLE 4-3 (continued)
GROUNDWATER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

PARAMETER	Units	Det. Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Maximum Detected	RIDEM GB GW Objective	# > RIDEM GB GW Objective	Max Upgr GW (unfiltered)	# > Max Upgr. GW (unfilt)	Max Upgr GW (filtered)	# > Max Upgr. GW (filt)
UPGRADIENT GROUNDWATER - TOTAL METALS RESULTS														
ALUMINUM	UG/L	5 / 5	26800	26800	958 J	82500 J	MW-6-R	01/06/94			82500	0		
ANTIMONY	UG/L	1 / 5	11.2	27	27	27	MW-5-S	01/06/94			27	0		
ARSENIC	UG/L	3 / 5	5.8	9	3.3 B	16.5	MW-6-R	01/06/94			16.5	0		
BARIUM	UG/L	5 / 5	70.1	70.1	12.2	144 B	MW-6-R	01/06/94			144	0	23.1	3
BERYLLIUM	UG/L	2 / 5	0.93	2	1.4 B	2.6 B	MW-6-R	01/06/94			2.6	0		
CADMIUM	UG/L	3 / 5	0.37	0.53	0.4 J	0.7 J	MW-6-R	01/06/94			0.7	0		
CALCIUM	UG/L	5 / 5	50800	50800	13400 J	84300 J	MW-5-S	01/06/94			84300	0	30600	3
CHROMIUM	UG/L	5 / 5	43.9	43.9	12.1	113	MW-6-R	01/06/94			113	0		
COBALT	UG/L	4 / 5	37.4	46.6	5 J	111	MW-6-R	01/06/94			111	0	28.2	2
COPPER	UG/L	3 / 5	41.3	67.4	24.9 B	120	MW-6-R	01/06/94			120	0		
IRON	UG/L	5 / 5	69100	69100	2580 J	206000 J	MW-6-R	01/06/94			206000	0	260	5
LEAD	UG/L	3 / 5	21	34.5	13.9 J	59 J	MW-6-R	01/06/94			59	0		
MAGNESIUM	UG/L	5 / 5	25500	25500	20500 J	32300 J	MW-5-S	01/06/94			32300	0	23400	3
MANGANESE	UG/L	5 / 5	1920	1920	216 J	4420 J	MW-5-S	01/06/94			4420	0	2760	2
NICKEL	UG/L	2 / 5	61.9	132	95	170	MW-6-R	01/06/94			170	0		
POTASSIUM	UG/L	5 / 5	8620	8620	5570 J	14800	MW-6-S	01/06/94			14800	0	7780	2
SILVER	UG/L	2 / 5	0.4	0.5	0.4 B	0.6 B	MW-6-R	01/06/94			0.6	0		
SODIUM	UG/L	5 / 5	89800	89800	46500 J	175000 J	MW-6-S	01/06/94			175000	0	134000	1
VANADIUM	UG/L	5 / 5	23	23	1.4	46.6 J	MW-6-R	01/06/94			46.6	0		
ZINC	UG/L	3 / 5	197	321	254	380	MW-6-R	01/06/94			380	0		
UPGRADIENT GROUNDWATER - DISSOLVED METALS RESULTS														
BARIUM	UG/L	1 / 1	23.1	23.1	23.1	23.1	MW-6-R	07/11/97			144	0	23.1	0
CALCIUM	UG/L	1 / 1	30600	30600	30600 J	30600 J	MW-6-R	07/11/97			84300	0	30600	0
COBALT	UG/L	1 / 1	28.2	28.2	28.2	28.2	MW-6-R	07/11/97			111	0	28.2	0
IRON	UG/L	1 / 1	260	260	260 J	260 J	MW-6-R	07/11/97			206000	0	260	0
MAGNESIUM	UG/L	1 / 1	23400	23400	23400 J	23400 J	MW-6-R	07/11/97			32300	0	23400	0
MANGANESE	UG/L	1 / 1	2760	2760	2760 J	2760 J	MW-6-R	07/11/97			4420	0	2760	0
POTASSIUM	UG/L	1 / 1	7780	7780	7780 J	7780 J	MW-6-R	07/11/97			14800	0	7780	0
SODIUM	UG/L	1 / 1	134000	134000	134000 J	134000 J	MW-6-R	07/11/97			175000	0	134000	0
UPGRADIENT GROUNDWATER - WATER QUALITY PARAMETERS RESULTS														
CHLORIDE	UG/L	3 / 3	209	209	63	481	MW-6-S	01/06/94			481	0		

NOTES.
-This table lists all detected compounds within each data grouping. Compounds not listed for a data group, such as VOCs in upgradient groundwater, were not detected.
-Groundwater samples collected in 1990 and 1994 were collected using standard bailing techniques.
-Groundwater samples collected in 1997 were collected using low-flow sampling techniques, with the exception of samples analyzed for dissolved metals
-Groundwater samples collected for dissolved metals analysis were collected using standard bailing techniques and were field-filtered to remove suspended solids prior to analysis.

TABLE 4-4
STORMWATER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	Marine AWQC Acute	# > Marine AWQC Acute	Marine AWQC Chronic	# > Marine AWQC Chronic
STORMWATER - METALS RESULTS													
ALUMINUM	7429905	UG/L	4 / 4	1460	1460	54 3 B	3370	OFF-SW-02	07/11/97				
ANTIMONY	7440360	UG/L	1 / 4	10.1	25 8	25.8 B	25 8 B	OFF-ST-02	12/06/93				
ARSENIC	7440382	UG/L	2 / 4	3 6	5.3	1 1 B	9.5	OFF-SW-02	07/11/97				
BARIUM	7440393	UG/L	4 / 4	45 6	45 6	22 4 B	73.7	OFF-SW-02	07/11/97	69	0	36	0
CALCIUM	7440702	UG/L	4 / 4	101000	101000	70500	126000 J	OFF-SW-01	07/11/97				
CHROMIUM	7440473	UG/L	2 / 4	4 5	7	6 7 J	7 3	OFF-SW-02	07/11/97				
COPPER	7440508	UG/L	3 / 4	10.3	11 8	7 1 B	21 3	OFF-SW-02	07/11/97	4.8	3	3.1	3
IRON	7439896	UG/L	4 / 4	17200	17200	558	49700	OFF-SW-02	07/11/97				
LEAD	7439921	UG/L	4 / 4	17 9	17 9	2 2 B	37 9	OFF-SW-02	07/11/97	210	0	8.1	2
MAGNESIUM	7439954	UG/L	4 / 4	156000	156000	8840	251000	OFF-SW-02	07/11/97				
MANGANESE	7439965	UG/L	4 / 4	1660	1660	131	3150 J	OFF-SW-01	07/11/97				
MERCURY	7439976	UG/L	1 / 4	0.036	0 04	0.04	0 04	OFF-SW-02	07/11/97	1 8	0	0.94	0
NICKEL	7440020	UG/L	1 / 4	8 1	14 9	14 9 B	14.9 B	OFF-ST-01	12/06/93	74	0	8.2	1
POTASSIUM	7440097	UG/L	4 / 4	49800	49800	5570	80300	OFF-SW-02	07/11/97				
SELENIUM	7782492	UG/L	1 / 4	1 7	3	3 B	3 B	OFF-ST-01	12/06/93	290	0	71	0
SODIUM	7440235	UG/L	4 / 4	1200000	1200000	29000	1960000	OFF-SW-02	07/11/97				
VANADIUM	7440622	UG/L	2 / 4	5.7	9.4	8 2 J	10.6	OFF-SW-02	07/11/97				
ZINC	7440666	UG/L	4 / 4	81 9	81.9	46 9	142	OFF-SW-02	07/11/97	90	2	81	2
STORMWATER - SEMIVOLATILE ORGANIC COMPOUNDS RESULTS													
2-METHYLNAPHTHALENE	91576	UG/L	1 / 4	4.5	2	2 J	2 J	OFF-ST-02	12/06/93				
ACENAPHTHENE	83329	UG/L	1 / 4	4 2	1	1 J	1 J	OFF-ST-02	12/06/93				
ANTHRACENE	120127	UG/L	1 / 4	4 2	1	1 J	1 J	OFF-ST-02	12/06/93				
BIS(2-ETHYLHEXYL)PHTHALATE	117817	UG/L	4 / 4	2 5	2.5	2 , J	3 J	OFF-ST-01, OFF-ST-02	12/06/93, 12/06/93				
FLUORENE	86737	UG/L	1 / 4	4.5	2	2 J	2 J	OFF-ST-02	12/06/93				
PHENANTHRENE	85018	UG/L	1 / 4	4 8	3	3 J	3 J	OFF-ST-02	12/06/93				
PHENOLS	Phenols	UG/L	1 / 2	3 8	2	2	2	OFF-SW-02	07/11/97				
PYRENE	129000	UG/L	1 / 4	4.2	1	1 J	1 J	OFF-ST-02	12/06/93				
STORMWATER - PESTICIDE/PCB RESULTS													
4,4'-DDT	50293	UG/L	1 / 4	0.046	0.023	0.023 J	0 023 J	OFF-ST-02	12/06/93	0 13	0	0.001	1
DIELDRIN	60571	UG/L	2 / 4	0 033	0.011	0.0058 J	0.016 J	OFF-ST-02	12/06/93	0.71	0	0.0019	2
ENDOSULFAN II	33213659	UG/L	1 / 4	0.043	0.013	0 013 J	0.013 J	OFF-ST-02	12/06/93	0 034	0	0.0087	1
ENDOSULFAN SULFATE	1031078	UG/L	1 / 4	0 043	0 011	0 011 J	0.011 J	OFF-ST-02	12/06/93				
ENDRIN	72208	UG/L	2 / 4	0 044	0 034	0 016 J	0.051 J	OFF-ST-02	12/06/93	0.037	1	0.0023	2

TABLE 4-5
SHORELINE SEDIMENT ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	RIDEM Soil Direct Exposure Residential	# > RIDEM Soil Direct Exp. Res
SHORELINE SEDIMENT - VOLATILE ORGANIC COMPOUNDS RESULTS										
2-BUTANONE	UG/KG	3 / 5	6	6.3	5 J	8	OFF-SSD-333	11/19/98	10000000	0
ACETONE	UG/KG	2 / 5	130	36	30 J	42	OFF-SSD-333	11/19/98	7800000	0
BENZENE	UG/KG	1 / 5	2.4	1	1 J	1 J	OFF-SSD-336	11/19/98	2500	0
BROMOMETHANE	UG/KG	1 / 5	2.6	2	2 J	2 J	OFF-SSD-336	11/19/98	800	0
CARBON DISULFIDE	UG/KG	2 / 5	7.5	14	2 J	27	OFF-SSD-333	11/19/98		
CHLOROMETHANE	UG/KG	1 / 5	4	9	9	9	OFF-SSD-336	11/19/98		
METHYLENE CHLORIDE	UG/KG	5 / 5	2.8	2.8	2 J	4 J	OFF-SSD-333, OFF-SSD-334	11/19/98, 11/19/98	45000	0
SHORELINE SEDIMENT - SEMI-VOLATILE ORGANIC COMPOUNDS RESULTS										
ACENAPHTHYLENE	UG/KG	1 / 5	1200	230	230 J	230 J	OFF-SSD-334	11/19/98	23000	0
ANTHRACENE	UG/KG	3 / 5	1100	500	400	600 J	OFF-SSD-334	11/19/98	35000	0
BENZO(A)ANTHRACENE	UG/KG	4 / 5	1500	1400	620 J	1900 J	OFF-SSD-334	11/19/98	900	3
BENZO(A)PYRENE	UG/KG	4 / 5	1200	1000	520 J	1400 J	OFF-SSD-334	11/19/98	400	4
BENZO(B)FLUORANTHENE	UG/KG	3 / 5	1300	1100	610 J	1700 J	OFF-SSD-335	11/19/98	900	2
BENZO(G,H,I)PERYLENE	UG/KG	3 / 5	1200	690	490	790 J	OFF-SSD-335	11/19/98	800	0
BENZO(K)FLUORANTHENE	UG/KG	2 / 5	1300	640	550	720 J	OFF-SSD-335	11/19/98	900	0
CHRYSENE	UG/KG	4 / 5	1400	1200	570 J	1700 J	OFF-SSD-334	11/19/98	400	4
DIBENZO(A,H)ANTHRACENE	UG/KG	1 / 5	1200	290	290 J	290 J	OFF-SSD-334	11/19/98	400	0
FLUORANTHENE	UG/KG	5 / 5	2500	2500	420 J	4400	OFF-SSD-334	11/19/98	20000	0
INDENO(1,2,3-CD)PYRENE	UG/KG	3 / 5	1300	830	550	1000 J	OFF-SSD-334	11/19/98	900	2
PHENANTHRENE	UG/KG	4 / 5	1800	1700	810 J	2300	OFF-SSD-335	11/19/98	40000	0
PYRENE	UG/KG	5 / 5	2100	2100	480 J	3700	OFF-SSD-334	11/19/98	13000	0

TABLE 4-5 (continued)
SHORELINE SEDIMENT ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det. Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect	RIDEM Soil Direct Exposure Residential	# > RIDEM Soil Direct Exp Res
SHORELINE SEDIMENT - METALS RESULTS										
ALUMINUM	MG/KG	5 / 5	7960	7960	7060	10300	OFF-SSD-333	11/19/98		
ANTIMONY	MG/KG	2 / 5	0 5	0 68	0 66	0 69 J	OFF-SSD-335	11/19/98	10	0
ARSENIC	MG/KG	5 / 5	5.1	5 1	4.2 J	7 1	OFF-SSD-337	11/19/98	1 7	5
BARIUM	MG/KG	4 / 5	12 3	14 4	12 5	15.9	OFF-SSD-335	11/19/98	5500	0
BERYLLIUM	MG/KG	1 / 5	0.21	0.48	0 48	0 48	OFF-SSD-337	11/19/98	0 4	1
CALCIUM	MG/KG	5 / 5	14700	14700	2080 J	33500 J	OFF-SSD-334	11/19/98		
CHROMIUM	MG/KG	5 / 5	13	13	10 9	15.8	OFF-SSD-337	11/19/98	1400	0
COBALT	MG/KG	5 / 5	7.8	7.8	6 1	11 9	OFF-SSD-334	11/19/98		
COPPER	MG/KG	5 / 5	31 3	31.3	16 2	61.4	OFF-SSD-335	11/19/98	3100	0
IRON	MG/KG	5 / 5	25900	25900	19400	41500	OFF-SSD-337	11/19/98		
LEAD	MG/KG	5 / 5	72.3	72 3	39 4 J	168	OFF-SSD-335	11/19/98	150	1
MAGNESIUM	MG/KG	5 / 5	5580	5580	4080	9100	OFF-SSD-333	11/19/98		
MANGANESE	MG/KG	5 / 5	541	541	265	1240	OFF-SSD-334	11/19/98	390	2
NICKEL	MG/KG	5 / 5	24 2	24.2	14 8	50 8	OFF-SSD-336	11/19/98	1000	0
POTASSIUM	MG/KG	5 / 5	505	505	476	550	OFF-SSD-335	11/19/98		
SILVER	MG/KG	4 / 5	6 9	7.9	5 7	11 3 J	OFF-SSD-337	11/19/98	200	0
SODIUM	MG/KG	5 / 5	2730	2730	1730	4460 J	OFF-SSD-335	11/19/98		
VANADIUM	MG/KG	5 / 5	25 6	25.6	15.7	52 5	OFF-SSD-335	11/19/98	550	0
ZINC	MG/KG	5 / 5	120	120	78 3	228	OFF-SSD-335	11/19/98	6000	0

TABLE 4-6
MARINE SEDIMENT ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Receptor	Fraction	Parameter	Units	Det Freq			Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
SedimentMarine	AVS/SEM	ACID VOLATILE SULFIDE	µMOLE	20	/	23	17	19	0 23		48.59		OFF-13	04/03/98
SedimentMarine	AVS/SEM	CADMIUM	µMOLE	22	/	22	0 0033	0 0033	0.001		0 011		OFF-18	04/03/98
SedimentMarine	AVS/SEM	COPPER	µMOLE	12	/	23	0 19	0 31	0 212		0 417		OFF-14	04/07/98
SedimentMarine	AVS/SEM	LEAD	µMOLE	23	/	23	0 22	0.22	0 039		0 589		OFF-13	04/03/98
SedimentMarine	AVS/SEM	NICKEL	µMOLE	3	/	23	0.045	0 14	0.126		0 152		OFF-5	03/27/98
SedimentMarine	AVS/SEM	SEM-AVS	µMOLE	1	/	1	0 56	0.56	0.562	J	0 562	J	OFF-3	03/27/98
SedimentMarine	AVS/SEM	SEM/AVS	µMOLE	20	/	20	0.29	0 29	0 023	J	3 442	J	OFF-3	03/27/98
SedimentMarine	AVS/SEM	ZINC	µMOLE	23	/	23	0 92	0.92	0 407		2 123		OFF-18	04/03/98
SedimentMarine	GS	PERCENT CLAY	PERCE	35	/	35	9 9	9 9	0.1		91 7		OFF-22	03/27/98
SedimentMarine	GS	PERCENT SAND	PERCE	35	/	35	60	60	0.3		98 5		OFF-4	03/27/98
SedimentMarine	GS	PERCENT SILT	PERCE	35	/	35	30	30	1 5		92 8		OFF-16	04/03/98
SedimentMarine	M	ALUMINUM	MG/KG	35	/	35	30800	30800	15734	J	92357 6	J	OFF-23	04/03/98
SedimentMarine	M	ARSENIC	MG/KG	35	/	35	5	5	2 7	J	8 5	J	OFF-14	04/07/98
SedimentMarine	M	CADMIUM	MG/KG	35	/	35	0 34	0 34	0 06		1 29		OFF-5	04/27/98
SedimentMarine	M	CHROMIUM	MG/KG	35	/	35	47	47	17 6		231 7		OFF-11	04/07/98
SedimentMarine	M	COPPER	MG/KG	35	/	35	25 6	25.6	2.5		84.9		OFF-18	04/07/98
SedimentMarine	M	IRON	MG/KG	35	/	35	24300	24300	11871 7	J	51702 9	J	OFF-23	04/03/98
SedimentMarine	M	LEAD	MG/KG	35	/	35	77 9	77 9	11 6		294		OFF-7	03/27/98
SedimentMarine	M	MANGANESE	MG/KG	35	/	35	334	334	166.8		669 7		OFF-23	04/03/98
SedimentMarine	M	MERCURY	MG/KG	26	/	35	0 25	0 32	0 051		1 901		OFF-18	04/07/98
SedimentMarine	M	NICKEL	MG/KG	34	/	35	23	23.5	12 5		75 8		OFF-11	04/07/98
SedimentMarine	M	SILVER	MG/KG	18	/	35	0.24	0.41	0 16	J	1.17	J	OFF-18	04/07/98
SedimentMarine	M	ZINC	MG/KG	16	/	35	114	208	106		314.8		OFF-2	03/27/98
SedimentMarine	OS	1,1'-BIPHENYL	UG/KG	28	/	35	17	20	0.8	J	151		OFF-5	03/27/98
SedimentMarine	OS	1-METHYLNAPHTHALENE	UG/KG	31	/	35	36	41	0 7	J	278	J	OFF-5	03/27/98
SedimentMarine	OS	1-METHYLPHENANTHRENE	UG/KG	32	/	35	160	170	1.9	J	1460		OFF-5	03/27/98
SedimentMarine	OS	2,3,5-TRIMETHYLNAPHTHALENE	UG/KG	31	/	35	14	15	0.3	J	121	J	OFF-5	03/27/98
SedimentMarine	OS	2,6-DIMETHYLNAPHTHALENE	UG/KG	33	/	35	61	64	2 5	J	476	J	OFF-5	03/27/98
SedimentMarine	OS	2-METHYLNAPHTHALENE	UG/KG	31	/	35	55	62	2 6	J	330	J	OFF-5	03/27/98

TABLE 4-6 (continued)
MARINE SEDIMENT ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Receptor	Fraction	Parameter	Units	Det Freq			Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
SedimentMarine	OS	ACENAPHTHENE	UG/KG	32	/	35	110	120	0.9	J	966		OFF-5	03/27/98
SedimentMarine	OS	ACENAPHTHYLENE	UG/KG	33	/	35	98	100	0.2	J	509		OFF-5	03/27/98
SedimentMarine	OS	ANTHRACENE	UG/KG	33	/	35	390	410	0.4	J	2810	J	OFF-5	03/27/98
SedimentMarine	OS	BENZO(A)ANTHRACENE	UG/KG	32	/	35	1100	1200	15.5		9300		OFF-5	03/27/98
SedimentMarine	OS	BENZO(A)PYRENE	UG/KG	32	/	35	820	900	19.8		4830		OFF-5	03/27/98
SedimentMarine	OS	BENZO(B,J,K)FLUORANTHENE	UG/KG	32	/	35	2700	2900	34.2		25000		OFF-5	03/27/98
SedimentMarine	OS	BENZO(E)PYRENE	UG/KG	32	/	35	900	980	16.5		7590	J	OFF-5	03/27/98
SedimentMarine	OS	BENZO(G,H,I)PERYLENE	UG/KG	35	/	35	810	810	1.8	J	5990	J	OFF-5	03/27/98
SedimentMarine	OS	CHRYSENE/TRIPHENYLENE	UG/KG	32	/	35	840	920	15	J	7300		OFF-5	03/27/98
SedimentMarine	OS	DIBENZO(A,H)ANTHRACENE	UG/KG	33	/	35	360	380	0.8	J	3410	J	OFF-5	03/27/98
SedimentMarine	OS	FLUORANTHENE	UG/KG	32	/	35	2500	2800	35.7		19200		OFF-5	03/27/98
SedimentMarine	OS	FLUORENE	UG/KG	33	/	35	140	150	0.3	J	1360	J	OFF-5	03/27/98
SedimentMarine	OS	INDENO(1,2,3-CD)PYRENE	UG/KG	35	/	35	890	890	1.2	J	7390		OFF-5	03/27/98
SedimentMarine	OS	NAPHTHALENE	UG/KG	31	/	35	60	68	2.7	J	258		OFF-5	03/27/98
SedimentMarine	OS	PERYLENE	UG/KG	34	/	35	270	280	6.3		1490	J	OFF-3	03/27/98
SedimentMarine	OS	PHENANTHRENE	UG/KG	32	/	35	1800	2000	16.2		14600		OFF-5	03/27/98
SedimentMarine	OS	PYRENE	UG/KG	32	/	35	2200	2400	40.2		16900		OFF-5	03/27/98
SedimentMarine	OS	SUM PAHS (6 HIGH MOLECULAR WEIGHT)	UG/KG	35	/	35	7900	7900	6		60900		OFF-5	03/27/98
SedimentMarine	OS	SUM PAHS (7 LOW MOLECULAR WEIGHT)	UG/KG	35	/	35	2600	2600	1		20800		OFF-5	03/27/98
SedimentMarine	OS	SUM PAHS (NOAA STATUS &TRENDS)	UG/KG	35	/	35	16000	16000	22		132000		OFF-5	03/27/98
SedimentMarine	PEST/PCB	101 (2,2',4,5,5') / 90	UG/KG	11	/	35	1.5	3.5	1.8		5.9		OFF-13	04/03/98
SedimentMarine	PEST/PCB	153 (2,2',4,4',5,5')	UG/KG	27	/	35	2.5	3.1	0.7		9.3		OFF-13	04/03/98
SedimentMarine	PEST/PCB	18 (2,2',5)	UG/KG	12	/	35	1	2.4	0.3	J	11.6		OFF-6	04/27/98
SedimentMarine	PEST/PCB	195 (2,2',3,3',4,4',5,6)	UG/KG	6	/	35	0.56	1.8	0.7	, J	3.7		OFF-13	04/03/98
SedimentMarine	PEST/PCB	1A,2A,3B,4A,5A,6B-HEXACHLOROCYCLOHEXANE	UG/KG	6	/	35	0.33	0.47	0.1	J	0.9		OFF-19	04/07/98
SedimentMarine	PEST/PCB	2,2',3,3',4,4',5,5',6-NONACHLOROBIPHENYL	UG/KG	9	/	35	0.81	1.6	0.4	J	4.8		OFF-18	04/07/98
SedimentMarine	PEST/PCB	2,2',3,3',4,4',5-HEPTACHLOROBIPHENYL (170)	UG/KG	13	/	35	1.1	2.2	1.1		5.8		OFF-13	04/03/98
SedimentMarine	PEST/PCB	2,2',3,3',4,4'-HEXACHLOROBIPHENYL	UG/KG	21	/	35	0.98	1.5	0.6	, J	4		OFF-13	04/03/98
SedimentMarine	PEST/PCB	2,2',3,4,4',5,5'-HEPTACHLOROBIPHENYL (180)	UG/KG	26	/	35	2	2.5	0.3	J	9.3		OFF-13	04/03/98
SedimentMarine	PEST/PCB	2,2',5,5'-TETRACHLOROBIPHENYL	UG/KG	13	/	35	1.2	2.5	1.1		8.1		OFF-6	04/27/98
SedimentMarine	PEST/PCB	2,3',4,4',5-PENTACHLOROBIPHENYL (118)	UG/KG	26	/	35	1.7	2.1	0.5	J	6.6		OFF-13	04/03/98

TABLE 4-6 (continued)
MARINE SEDIMENT ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Receptor	Fraction	Parameter	Units	Det Freq			Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
SedimentMarine	PEST/PCB	2,3,3',4,4'-PENTACHLOROBIPHENYL (105)	UG/KG	6	/	35	0.68	2.2	1.7	J	3.5	J	OFF-13	04/03/98
SedimentMarine	PEST/PCB	2,4'-DDE	UG/KG	1	/	35	0.41	0.9	0.9		0.9		OFF-12	04/03/98
SedimentMarine	PEST/PCB	2,4'-DDT	UG/KG	13	/	35	0.78	1.3	0.6	J	2.6		OFF-4	03/27/98
SedimentMarine	PEST/PCB	3,3',4,4',5-PENTACHLOROBIPHENYL (126)	UG/KG	18	/	35	0.93	1.6	0.6	J	4.9	J	OFF-13	04/03/98
SedimentMarine	PEST/PCB	4,4'-DDD	UG/KG	22	/	35	4.3	6.6	0.6	J	46.2	J	OFF-18	04/07/98
SedimentMarine	PEST/PCB	4,4'-DDE	UG/KG	12	/	35	2	4.5	0.5	J	10.8		OFF-13	04/03/98
SedimentMarine	PEST/PCB	4,4'-DDT	UG/KG	30	/	35	3.7	4.3	0.6	J	17.3	J	OFF-18	04/07/98
SedimentMarine	PEST/PCB	44 (2,2'3,5')	UG/KG	28	/	35	1	1.2	0.2	J	6.9		OFF-6	04/27/98
SedimentMarine	PEST/PCB	8 (2,4)	UG/KG	12	/	35	0.93	2.4	0.6		8.5	, J	OFF-1, OFF-19	27/98, 04/07
SedimentMarine	PEST/PCB	ALDRIN	UG/KG	2	/	35	0.34	0.15	0.1	J	0.2	J	OFF-19	04/07/98
SedimentMarine	PEST/PCB	ALPHA-CHLORDANE	UG/KG	18	/	35	0.58	0.75	0.1	J	1.4		OFF-13, OFF-5	03/98, 03/27
SedimentMarine	PEST/PCB	DECACHLOROBIPHENYL (209)	UG/KG	14	/	35	1.1	2.3	0.3	J	9.3		OFF-18	04/07/98
SedimentMarine	PEST/PCB	HEPTACHLOR	UG/KG	3	/	35	0.28	0.2	0.1	J	0.3	J	OFF-7	03/27/98
SedimentMarine	PEST/PCB	HEPTACHLOR EPOXIDE	UG/KG	8	/	35	0.6	1.8	0.6	J	4.7		OFF-6	04/27/98
SedimentMarine	PEST/PCB	HEXACHLOROBENZENE	UG/KG	2	/	35	0.24	0.7	0.5		0.9		OFF-19	04/07/98
SedimentMarine	PEST/PCB	MIREX	UG/KG	7	/	35	0.35	0.53	0.3	J	1.1	J	OFF-23	04/03/98
SedimentMarine	PEST/PCB	PCB 138/163/164	UG/KG	30	/	35	4.6	5.4	0.6		16.2	J	OFF-5	03/27/98
SedimentMarine	PEST/PCB	PCB 187/182/159	UG/KG	25	/	35	1.6	2.1	0.5		5.9	J	OFF-18	04/07/98
SedimentMarine	PEST/PCB	PCB 188	UG/KG	18	/	35	0.64	0.96	0.5	J	2.6		OFF-6	03/27/98
SedimentMarine	PEST/PCB	PCB 200	UG/KG	27	/	35	0.58	0.68	0.1	J	2		OFF-5	03/27/98
SedimentMarine	PEST/PCB	PCB 28/50	UG/KG	23	/	35	1.5	2.1	0.1	J	20		OFF-6	04/27/98
SedimentMarine	PEST/PCB	PCB 66/95	UG/KG	23	/	35	2.1	3	0.6		10.7		OFF-6	04/27/98
SedimentMarine	PEST/PCB	PCB 87	UG/KG	18	/	35	0.71	1.1	0.5	J	2.5	J	OFF-13	04/03/98
SedimentMarine	PEST/PCB	SUM OF PCB CONGENERS	UG/KG	35	/	35	26	26	0.4		106.9		OFF-6	04/27/98
SedimentMarine	PEST/PCB	SUM OF PCB CONGENERS X 2	UG/KG	35	/	35	52	52	0.8		213.8		OFF-6	04/27/98
SedimentMarine	PEST/PCB	TRANS-NONACHLOR	UG/KG	13	/	35	0.5	0.68	0.1	J	1.3		OFF-5	03/27/98
SedimentMarine	TOC	% WATER	PERCE	35	/	35	34	34	15.2		60.2		OFF-13	04/03/98
SedimentMarine	TOC	LOSS ON IGNITION	PERCE	35	/	35	4.3	4.3	1.6		11.7		OFF-18	04/07/98
SedimentMarine	TOC	TOTAL ORGANIC CARBON	PERCE	35	/	35	1.8	1.8	0.7		5.1		OFF-18	04/07/98

TABLE 4-7A
CLAM ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det. Freq	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
CLAM - METALS RESULTS											
ALUMINUM	7429905	UG/KG	13 / 13	755	755	508 7	J	1200		OFF-15	05/14/98
ARSENIC	7440382	UG/KG	13 / 13	5 2	5 2	4 3		7 2		OFF-15	05/14/98
CADMIUM	7440439	UG/KG	13 / 13	7 5	7 5	5 3		11.2		OFF-15	05/14/98
CHROMIUM	7440473	UG/KG	7 / 13	9 6	17.6	3 1	J	64 4		OFF-15	05/14/98
COPPER	7440508	UG/KG	2 / 13	3 1	6.5	4 2	J	8 7		OFF-21	05/14/98
IRON	7439896	UG/KG	13 / 13	261	261	106 7		438 6		OFF-15	05/14/98
LEAD	7439921	UG/KG	13 / 13	6.5	6 5	3 9		9 9		OFF-15	05/14/98
MERCURY	7439976	UG/KG	13 / 13	2 8	2 8	1 9		4		OFF-16	05/21/98
NICKEL	7440020	UG/KG	13 / 13	20.6	20.6	14		29.3		OFF-10	05/14/98
ZINC	7440666	UG/KG	13 / 13	79 1	79.1	58 9		112		OFF-15	05/14/98
CLAM - SEMI-VOLATILE ORGANIC RESULTS											
1,1'-BIPHENYL	92524	UG/KG	13 / 13	1 2	1 2	0.677347723	J	2 043536911		OFF-19	05/21/98
1-METHYLNAPHTHALENE	90120	UG/KG	1 / 13	2.7	19	19		19		OFF-10	05/14/98
1-METHYLPHENANTHRENE	832699	UG/KG	13 / 13	2 7	2 7	1 272930581	J	4 656824761		OFF-19	05/21/98
2,3,5-TRIMETHYLNAPHTHALENE	2245387	UG/KG	8 / 13	1.2	1 2	1 041960148		1 663607059		OFF-20	05/14/98
2,6-DIMETHYLNAPHTHALENE	581420	UG/KG	13 / 13	2	2	1 321680511		2 866484828		OFF-19	05/21/98
2-METHYLNAPHTHALENE	91576	UG/KG	1 / 13	3 6	24	24		24		OFF-10	05/14/98
ACENAPHTHENE	83329	UG/KG	12 / 13	2.2	2 3	1		4 894634968		OFF-23	05/14/98
ACENAPHTHYLENE	208968	UG/KG	13 / 13	2 1	2 1	1 3		3 578131067		OFF-21	05/14/98
ANTHRACENE	120127	UG/KG	13 / 13	5.9	5 9	3 18149972	J	11 14956916	J	OFF-19	05/21/98
BENZO(A)ANTHRACENE	56553	UG/KG	13 / 13	9.9	9 9	2 228426036		21.56732765		OFF-19	05/21/98
BENZO(A)PYRENE	50328	UG/KG	13 / 13	6 1	6.1	1 505184627	J	12 20568356		OFF-19	05/21/98
BENZO(B)FLUORANTHENE	205992	UG/KG	13 / 13	8 6	8 6	2 9		14 66688273		OFF-23	05/14/98
BENZO(E)PYRENE	192972	UG/KG	13 / 13	13	13	5 216937205		21.41679359		OFF-23	05/14/98
BENZO(G,H,I)PERYLENE	191242	UG/KG	12 / 13	5 5	5 9	1 774951633	J	11 80313223	J	OFF-16	05/21/98
BENZO(K)FLUORANTHENE	207089	UG/KG	13 / 13	9 3	9 3	2.056580022		14.80912657		OFF-19	05/21/98
CHRYSENE	218019	UG/KG	13 / 13	18	18	6.592832899		27.65743072		OFF-23	05/14/98
DIBENZO(A,H)ANTHRACENE	53703	UG/KG	6 / 13	1.1	1 2	0 71237675	J	2 276983253	J	OFF-19	05/21/98
FLUORANTHENE	206440	UG/KG	13 / 13	43	43	21.21847645		77.76515177		OFF-23	05/14/98
FLUORENE	86737	UG/KG	13 / 13	2.4	2 4	1 2		5.778426146		OFF-19	05/21/98
INDENO(1,2,3-CD)PYRENE	193395	UG/KG	10 / 13	4	4 9	0 94		8.927584209	J	OFF-19	05/21/98
NAPHTHALENE	91203	UG/KG	1 / 13	6.5	47	47		47		OFF-10	05/14/98
PHENANTHRENE	85018	UG/KG	13 / 13	14	14	5 978856409		27 57318769		OFF-19	05/21/98
PYRENE	129000	UG/KG	13 / 13	34	34	18 8322403		64 15653696		OFF-23	05/14/98
TOTAL PAH	TOTPAH	UG/KG	13 / 13	200	200	94 61302062		321.8154523		OFF-23	05/14/98

TABLE 4-7A (continued)
CLAM ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect
CLAM - PESTICIDE/PCB RESULTS									
101 (2 2'4 5 5')	37680732	UG/KG	12 / 13	4	4.2	2.976098285	6.3	OFF-15	05/14/98
138 (2,2',3,4,4',5)	35065282	UG/KG	11 / 13	7.2	8	6.374124657	11.49035992	OFF-15	05/14/98
153 (2,2',4,4',5,5')	35065271	UG/KG	13 / 13	12	12	8.484260909	17.31803742	OFF-15	05/14/98
18 (2,2',5)	PCB18	UG/KG	5 / 13	0.29	0.23	0.122292121 J	0.292487715	OFF-12	05/14/98
187 (2,2',3,4',5,5',6)	PCB187	UG/KG	13 / 13	4.5	4.5	2.940782587	6.8	OFF-15	05/14/98
195 (2,2',3,3',4,4',5,6)	52663782	UG/KG	13 / 13	1.3	1.3	0.893924559	2.1	OFF-15	05/14/98
2,2',3,3',4,4',5,5',6-NONACHLOROBIPHENYL	40186729	UG/KG	13 / 13	1.2	1.2	0.641791991	2.9	OFF-15	05/14/98
2,2',3,3',4,4',5-HEPTACHLOROBIPHENYL (170)	35065306	UG/KG	13 / 13	2.6	2.6	1.198775755	8.2	OFF-10	05/14/98
2,2',3,4,4',5,5'-HEPTACHLOROBIPHENYL (180)	35065293	UG/KG	13 / 13	6.6	6.6	3.924099602	9.1	OFF-15	05/14/98
2,2',5,5'-TETRACHLOROBIPHENYL	35693993	UG/KG	13 / 13	1.8	1.8	1.155481597	3.424428244	OFF-20	05/14/98
2,3',4,4',5-PENTACHLOROBIPHENYL (118)	31508006	UG/KG	13 / 13	3.5	3.5	2.2	4.535738389	OFF-16	05/21/98
2,3,3',4,4'-PENTACHLOROBIPHENYL (105)	32598144	UG/KG	9 / 13	1.3	1.7	0.742756965 J	3.9	OFF-10	05/14/98
2,4'-DDD	53190	UG/KG	12 / 13	5	5.4	1.136879701	17.28313404	OFF-20	05/14/98
2,4'-DDT	789026	UG/KG	12 / 13	0.76	0.76	0.133469097 J	2.24286337	OFF-19	05/21/98
2,4,4'-TRICHLOROBIPHENYLS (28)	7012375	UG/KG	12 / 13	0.77	0.82	0.513836869	1.342379796	OFF-11	05/14/98
4,4'-DDD	72548	UG/KG	1 / 13	1.7	6.8	6.8	6.8	OFF-10	05/14/98
4,4'-DDE	72559	UG/KG	12 / 13	3.4	3.6	1.951319194 J	5.869821549	OFF-11	05/14/98
44 (2,2'3,5')	41464395	UG/KG	13 / 13	0.52	0.52	0.352295802	0.743480139	OFF-21	05/14/98
66 (2,3'4,4')	32598100	UG/KG	13 / 13	1.8	1.8	1.219485468	6.5	OFF-10	05/14/98
8 (2,4)	PCB8	UG/KG	11 / 13	1.7	1.9	0.49269266 J	3.3	OFF-10	05/14/98
ALPHA-CHLORDANE	5103719	UG/KG	13 / 13	1.2	1.2	0.886846789	1.886543227	OFF-21	05/14/98
DECACHLOROBIPHENYL (209)	2051243	UG/KG	13 / 13	2.1	2.1	1.278923144	3.6	OFF-10	05/14/98
DIELDRIN	60571	UG/KG	13 / 13	3.2	3.2	1.765666072	4.6	OFF-15	05/14/98
ENDOSULFAN II	33213659	UG/KG	8 / 13	2.1	3.2	1.250246647	6.809299283	OFF-20	05/14/98
GAMMA-BHC	58899	UG/KG	4 / 13	0.6	1.7	1.3	2.3	OFF-10	05/14/98
HEPTACHLOR	76448	UG/KG	1 / 13	0.52	0.27	0.270996771 J	0.270996771 J	OFF-16	05/21/98
HEPTACHLOR EPOXIDE	1024573	UG/KG	4 / 13	0.22	0.15	0.1	0.193375967	OFF-17	05/14/98
HEXACHLOROBENZENE	118741	UG/KG	12 / 13	0.72	0.76	0.336313741	1.1	OFF-10	05/14/98
MIREX	2385855	UG/KG	11 / 13	0.54	0.6	0.202756108	3.6	OFF-15	05/14/98
PCB 103	TBD	UG/KG	13 / 13	38	38	15.50262679	180	OFF-10	05/14/98
PCB 112	TBD	UG/KG	13 / 13	37	37	14.49914501	180	OFF-10	05/14/98
PCB 166	TBD	UG/KG	13 / 13	87	87	33.33398523	470	OFF-10	05/14/98
PCB 34	TBD	UG/KG	13 / 13	37	37	14.47736401	180	OFF-10	05/14/98
PCB 87	38380028	UG/KG	1 / 13	0.87	4	4	4	OFF-10	05/14/98
SUM OF PCB CONGENERS	SUMPCBC	UG/KG	13 / 13	60	60	39.57262555	94	OFF-10	05/14/98
SUM OF PCB CONGENERS X 2	SUMPCBCX2	UG/KG	13 / 13	120	120	79.14525111	190	OFF-10	05/14/98
TRANS-NONACHLOR	TRANSNON	UG/KG	13 / 13	1	1	0.5	1.689337665	OFF-19	05/21/98

TABLE 4-7B
BLUE MUSSEL ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
MUSSEL - METALS RESULTS											
ALUMINUM	7429905	UG/KG	6 / 8	97 4	127	58 3	J	212 6	J	OFF-7	05/26/98
ARSENIC	7440382	UG/KG	8 / 8	1 8	1.8	0 9		2 7		OFF-5	05/26/98
CADMIUM	7440439	UG/KG	8 / 8	10 7	10 7	5		17		OFF-7	05/26/98
CHROMIUM	7440473	UG/KG	3 / 8	10 9	28 7	10.3		40 5		OFF-7	05/26/98
COPPER	7440508	UG/KG	6 / 8	4 4	5	1 4	J	10		OFF-5	05/26/98
IRON	7439896	UG/KG	8 / 8	434	434	320 6		538		OFF-5	05/26/98
LEAD	7439921	UG/KG	8 / 8	4.7	4 7	3		6 3		OFF-3	05/26/98
MERCURY	7439976	UG/KG	8 / 8	2 2	2.2	1 3		3		OFF-1	05/26/98
NICKEL	7440020	UG/KG	8 / 8	9	9	5 7		12.4		OFF-3	05/26/98
ZINC	7440666	UG/KG	7 / 7	132	132	94		157.3		OFF-2	05/26/98
MUSSEL - SEMI-VOLATILE ORGANIC COMPOUND RESULTS											
1,1'-BIPHENYL	92524	UG/KG	8 / 8	1.7	1 7	1 017094247		3.436154307		OFF-1	05/26/98
1-METHYLNAPHTHALENE	90120	UG/KG	4 / 8	5 2	7.9	6 946095569		9 5		OFF-5	05/26/98
1-METHYLPHENANTHRENE	832699	UG/KG	8 / 8	4 1	4.1	2 817827195		5 305410731		OFF-7	05/26/98
2,3,5-TRIMETHYLNAPHTHALENE	2245387	UG/KG	7 / 8	2 7	3	1.203622341		5 3		OFF-5	05/26/98
2,6-DIMETHYLNAPHTHALENE	581420	UG/KG	8 / 8	5 1	5 1	3 337641716		7.1		OFF-5	05/26/98
2-METHYLNAPHTHALENE	91576	UG/KG	4 / 8	9	14	12 03094115		17		OFF-5	05/26/98
ACENAPHTHENE	83329	UG/KG	8 / 8	4.4	4 4	2 497497399		7.7		OFF-5	05/26/98
ACENAPHTHYLENE	208968	UG/KG	8 / 8	5	5	4 040127051		7.3		OFF-5	05/26/98
ANTHRACENE	120127	UG/KG	8 / 8	8 5	8 5	6.47159275	J	11 2599828	J	OFF-7	05/26/98
BENZO(A)ANTHRACENE	56553	UG/KG	8 / 8	14	14	7 476021872		18 95000773		OFF-22	05/26/98
BENZO(A)PYRENE	50328	UG/KG	8 / 8	7 5	7 5	4 789827898		10		OFF-5	05/26/98
BENZO(B)FLUORANTHENE	205992	UG/KG	8 / 8	15	15	9 409983013		25 73805325		OFF-22	05/26/98
BENZO(E)PYRENE	192972	UG/KG	8 / 8	27	27	15 29325606		42 91424938		OFF-22	05/26/98
BENZO(G,H,I)PERYLENE	191242	UG/KG	8 / 8	12	12	6.83739038	J	19 19731106		OFF-22	05/26/98
BENZO(K)FLUORANTHENE	207089	UG/KG	8 / 8	16	16	8 465027485		25.18006542		OFF-22	05/26/98
CHRYSENE	218019	UG/KG	8 / 8	32	32	23.07302199		44 46738186		OFF-22	05/26/98
DIBENZO(A,H)ANTHRACENE	53703	UG/KG	7 / 8	1 3	1 4	1		2 038154724	J	OFF-7	05/26/98
FLUORANTHENE	206440	UG/KG	8 / 8	73	73	47 19992693		109 6157913		OFF-7	05/26/98
FLUORENE	86737	UG/KG	8 / 8	7.2	7 2	3.139576327		12		OFF-5	05/26/98

TABLE 4-7B (continued)
BLUE MUSSEL ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
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Parameter	CasNo	Units	Det Freq.	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
INDENO(1,2,3-CD)PYRENE	193395	UG/KG	8 / 8	8	8	3.850535493	J	11		OFF-5	05/26/98
NAPHTHALENE	91203	UG/KG	2 / 8	9.4	23	17.23841531		29		OFF-5	05/26/98
PERYLENE	198550	UG/KG	5 / 8	11	16	9.079712694		26.80455986		OFF-22	05/26/98
PHENANTHRENE	85018	UG/KG	8 / 8	22	22	17.34983804		32		OFF-5	05/26/98
PYRENE	129000	UG/KG	8 / 8	57	57	34.15592503		95.77581274		OFF-7	05/26/98
TOTAL PAH	TOTPAH	UG/KG	8 / 8	370	370	258.2266783		502.9731376		OFF-7	05/26/98
MUSSEL - PESTICIDE/PCB RESULTS											
101 (2 2'4 5 5')	37680732	UG/KG	8 / 8	14	14	10.0759227		16.56775137		OFF-3	05/26/98
138 (2,2',3,4,4',5)	35065282	UG/KG	8 / 8	29	29	20.79688885		35.05752489		OFF-3	05/26/98
153 (2,2',4,4',5,5')	35065271	UG/KG	8 / 8	45	45	32.6598067		53.60046469		OFF-3	05/26/98
18 (2,2',5)	PCB18	UG/KG	7 / 8	0.98	1.1	0.777840871		1.46905957	J	OFF-22	05/26/98
187 (2,2',3,4',5,5',6)	PCB187	UG/KG	8 / 8	14	14	11.05603558		16.99122197		OFF-3	05/26/98
195 (2,2',3,3',4,4',5,6)	52663782	UG/KG	2 / 8	0.32	0.13	0.105883	J	0.154605958	J	OFF-4	05/26/98
2,2',3,3',4,4',5,5',6-NONACHLOROBIPHENYL	40186729	UG/KG	6 / 8	0.49	0.56	0.131582757	J	1.2		OFF-5	05/26/98
2,2',3,3',4,4',5-HEPTACHLOROBIPHENYL (170)	35065306	UG/KG	6 / 8	0.9	1.1	0.841924048		1.44226788		OFF-3	05/26/98
2,2',3,3',4,4'-HEXACHLOROBIPHENYL	38380073	UG/KG	6 / 8	2.1	2.7	0.500583925	J	4.041797931		OFF-2	05/26/98
2,2',3,4,4',5,5'-HEPTACHLOROBIPHENYL (180)	35065293	UG/KG	7 / 8	7.9	8.9	2.696690928		16		OFF-5	05/26/98
2,2',5,5'-TETRACHLOROBIPHENYL	35693993	UG/KG	8 / 8	4.6	4.6	3.873170443		5.917078239		OFF-2	05/26/98
2,3',4,4',5-PENTACHLOROBIPHENYL (118)	31508006	UG/KG	7 / 8	13	14	9.311255505		17.92331186		OFF-3	05/26/98
2,3,3',4,4'-PENTACHLOROBIPHENYL (105)	32598144	UG/KG	7 / 8	2.9	3.2	1.89693185		4.5		OFF-5	05/26/98
2,4'-DDD	53190	UG/KG	8 / 8	2.7	2.7	1.757157924		3.971987194		OFF-7	05/26/98
2,4'-DDT	789026	UG/KG	8 / 8	1.9	1.9	0.834728116	J	2.9		OFF-5	05/26/98
2,4,4'-TRICHLOROBIPHENYLS (28)	7012375	UG/KG	8 / 8	1.3	1.3	0.683693684		1.847969398		OFF-7	05/26/98
4,4'-DDD	72548	UG/KG	8 / 8	7.3	7.3	4.349797135		10.57295286		OFF-7	05/26/98
4,4'-DDE	72559	UG/KG	7 / 8	14	16	13.04156136		19.06830406		OFF-7	05/26/98
4,4'-DDT	50293	UG/KG	8 / 8	4.1	4.1	2.409033246		5.410711204		OFF-3	05/26/98
44 (2,2'3,5')	41464395	UG/KG	8 / 8	2.3	2.3	1.753219403		3.4		OFF-5	05/26/98
66 (2,3'4,4')	32598100	UG/KG	8 / 8	2.9	2.9	1.410961169		4.4		OFF-5	05/26/98
8 (2,4)	PCB8	UG/KG	8 / 8	2.4	2.4	2.043126531		3.02422927		OFF-22	05/26/98
ALPHA-CHLORDANE	5103719	UG/KG	7 / 8	4	4.5	4.010694806		4.928441529		OFF-2	05/26/98
DECACHLOROBIPHENYL (209)	2051243	UG/KG	8 / 8	1.2	1.2	0.636864654		1.606741063		OFF-1	05/26/98
DIELDRIN	60571	UG/KG	8 / 8	4.3	4.3	2.419438667		6.414343904		OFF-4	05/26/98

TABLE 4-7B (continued)
BLUE MUSSEL ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
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Parameter	CasNo	Units	Det. Freq	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
ENDOSULFAN I	959988	UG/KG	1 / 8	0.58	1 8	1.795762299		1 795762299		OFF-2	05/26/98
ENDOSULFAN II	33213659	UG/KG	8 / 8	1 6	1 6	0.330894459	J	3.030162677		OFF-1	05/26/98
GAMMA-BHC	58899	UG/KG	8 / 8	0 48	0 48	0 303132784		0 722804197		OFF-7	05/26/98
HEPTACHLOR EPOXIDE	1024573	UG/KG	2 / 8	0 26	0.45	0 412801508		0.477646674		OFF-3	05/26/98
HEXACHLOROBENZENE	118741	UG/KG	6 / 8	0 32	0 37	0.244950311		0 592771547		OFF-6	05/26/98
MIREX	2385855	UG/KG	5 / 8	1	1.6	0.328406252		5 7		OFF-5	05/26/98
PCB 103	TBD	UG/KG	8 / 8	35	35	16 88149359		100		OFF-5	05/26/98
PCB 112	TBD	UG/KG	8 / 8	31	31	15 2222564		90		OFF-5	05/26/98
PCB 166	TBD	UG/KG	8 / 8	83	83	43 21134894		230		OFF-5	05/26/98
PCB 34	TBD	UG/KG	8 / 8	33	33	16 31529697		94		OFF-5	05/26/98
PCB 87	38380028	UG/KG	8 / 8	3 5	3 5	2.126816467		4.8		OFF-5	05/26/98
SUM OF PCB CONGENERS	SUMPCBC	UG/KG	8 / 8	150	150	109.7803941		180		OFF-5	05/26/98
SUM OF PCB CONGENERS X 2	SUMPCBCX2	UG/KG	8 / 8	300	300	219.5607882		370		OFF-5	05/26/98
TRANS-NONACHLOR	TRANSNON	UG/KG	8 / 8	3.6	3 6	2.738924622		4.31034947		OFF-3	05/26/98

TABLE 4-7C
LOBSTER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det. Freq	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
LOBSTER - METALS RESULTS											
ALUMINUM	7429905	UG/KG	14 / 14	359	359	314.2		397.3		OFF-15	06/08/98
ARSENIC	7440382	UG/KG	14 / 14	8.1	8 1	5.7		10.2		OFF-17	06/12/98
CADMIUM	7440439	UG/KG	13 / 14	4 2	4 5	1 5		13 3		OFF-13	06/10/98
CHROMIUM	7440473	UG/KG	14 / 14	15 3	15 3	10 5		21 1		OFF-20	06/08/98
COPPER	7440508	UG/KG	14 / 14	144	144	101.3		194 2		OFF-17	06/12/98
IRON	7439896	UG/KG	14 / 14	126	126	76.4		168 8		OFF-23	06/08/98
LEAD	7439921	UG/KG	14 / 14	15 6	15.6	11 3		19		OFF-15	06/08/98
MERCURY	7439976	UG/KG	14 / 14	2 5	2 5	1 4		7 2		OFF-14	06/12/98
NICKEL	7440020	UG/KG	14 / 14	35.6	35 6	28 5		44 9		OFF-20	06/08/98
SILVER	7440224	UG/KG	14 / 14	3	3	2 3		5		OFF-20	06/08/98
ZINC	7440666	UG/KG	13 / 13	261	261	231		297 5		OFF-16	06/10/98
LOBSTER - SEMI-VOLATILE ORGANIC RESULTS											
1,1'-BIPHENYL	92524	UG/KG	2 / 12	0.66	0.99	0 987034068	J	0.997838352		OFF-23	06/08/98
1-METHYLNAPHTHALENE	90120	UG/KG	2 / 12	4 1	11	10 60160942	J	11.72533379		OFF-18	06/08/98
1-METHYLPHENANTHRENE	832699	UG/KG	11 / 12	2.1	2.3	0 86187296	J	4.068748484		OFF-16	06/10/98
2,3,5-TRIMETHYLNAPHTHALENE	2245387	UG/KG	6 / 12	0 85	1 3	0 853248418		2 073974239		OFF-18	06/08/98
2,6-DIMETHYLNAPHTHALENE	581420	UG/KG	10 / 12	1.7	1 9	1 503517031	J	2 365672579	J	OFF-18	06/08/98
2-METHYLNAPHTHALENE	91576	UG/KG	6 / 12	7 2	11	8.171733787		16.78485566		OFF-18	06/08/98
ACENAPHTHENE	83329	UG/KG	7 / 12	1.8	2.5	1.16778213		7.508179504		OFF-16	06/08/98
ANTHRACENE	120127	UG/KG	10 / 12	1 6	1 8	0 574153899	J	4 443180278	J	OFF-16	06/10/98
BENZO(A)ANTHRACENE	56553	UG/KG	12 / 12	16	16	1 130349058	J	101 6105333		OFF-21	06/15/98
BENZO(A)PYRENE	50328	UG/KG	12 / 12	31	31	1.559298083	J	258.5362008		OFF-21	06/15/98
BENZO(B)FLUORANTHENE	205992	UG/KG	12 / 12	39	39	1.958068657		315 4466174		OFF-21	06/15/98
BENZO(E)PYRENE	192972	UG/KG	12 / 12	19	19	2 803220052		108 1004369		OFF-21	06/15/98
BENZO(G,H,I)PERYLENE	191242	UG/KG	12 / 12	8 7	8 7	1 581272844		41.8351481		OFF-21	06/15/98
BENZO(K)FLUORANTHENE	207089	UG/KG	12 / 12	22	22	1 57157902		160 5362349		OFF-21	06/15/98
CHRYSENE	218019	UG/KG	12 / 12	38	38	4 646832023		225 0360876		OFF-21	06/15/98
DIBENZO(A,H)ANTHRACENE	53703	UG/KG	5 / 12	1 7	3.4	0.857178617	J	12.08139321		OFF-21	06/15/98
FLUORANTHENE	206440	UG/KG	12 / 12	56	56	9.672863895		212.2434421		OFF-21	06/15/98
FLUORENE	86737	UG/KG	10 / 12	1.4	1 6	0.741837155	J	2 634581522		OFF-16	06/08/98
INDENO(1,2,3-CD)PYRENE	193395	UG/KG	10 / 12	15	18	1.94236178	J	114.478557	J	OFF-21	06/15/98

TABLE 4-7C (continued)
LOBSTER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det Freq.	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
NAPHTHALENE	91203	UG/KG	4 / 12	9	17	13.24564436	J	19 80592418		OFF-16	06/08/98
PERYLENE	198550	UG/KG	2 / 12	5.2	7.6	4.808820253		10 35654717		OFF-13	06/10/98
PHENANTHRENE	85018	UG/KG	9 / 12	6.9	8 7	4.835773929		14.62490856		OFF-23	06/08/98
PYRENE	129000	UG/KG	12 / 12	45	45	6.940447684		159.9843904		OFF-21	06/15/98
TOTAL PAH	TOTPAH	UG/KG	12 / 12	340	340	65.22704219		1782.913625		OFF-21	06/15/98
LOBSTER - PESTICIDE/PCB RESULTS											
101 (2,2'4 5 5')	37680732	UG/KG	12 / 12	1 7	1 7	0 467754157	J	9.146393299		OFF-17	06/10/98
138 (2,2',3,4,4',5)	35065282	UG/KG	12 / 12	22	22	13 2647315		35.49208831		OFF-21	06/15/98
153 (2,2',4,4',5,5')	35065271	UG/KG	12 / 12	34	34	19 41496486		55.49838507		OFF-21	06/15/98
18 (2,2',5)	PCB18	UG/KG	1 / 12	0.45	3 6	3 579465952		3 579465952		OFF-17	06/10/98
187 (2,2',3,4',5,5',6)	PCB187	UG/KG	12 / 12	10	10	5 686238159		15 82175197		OFF-15	06/08/98
195 (2,2',3,3',4,4',5,6)	52663782	UG/KG	12 / 12	1.1	1.1	0 602257342		1.586675303		OFF-15	06/08/98
2,2',3,3',4,4',5,5',6-NONACHLOROBIPHENYL	40186729	UG/KG	10 / 12	0 37	0.4	0 150225533	J	0 748863633		OFF-21	06/15/98
2,2',3,3',4,4',5-HEPTACHLOROBIPHENYL (170)	35065306	UG/KG	12 / 12	4 7	4 7	2 693005106		7.586558003		OFF-15	06/08/98
2,2',3,3',4,4'-HEXACHLOROBIPHENYL	38380073	UG/KG	11 / 12	3 3	3.6	1 976348086		5.724379392		OFF-21	06/15/98
2,2',3,4,4',5,5'-HEPTACHLOROBIPHENYL (180)	35065293	UG/KG	12 / 12	11	11	5 551617037		17.30393632		OFF-21	06/15/98
2,2',5,5'-TETRACHLOROBIPHENYL	35693993	UG/KG	11 / 12	2.8	3	0 769739668		20 33040704		OFF-17	06/10/98
2,3',4,4',5-PENTACHLOROBIPHENYL (118)	31508006	UG/KG	12 / 12	16	16	8 844133211		24.15793602		OFF-21	06/15/98
2,3,3',4,4'-PENTACHLOROBIPHENYL (105)	32598144	UG/KG	12 / 12	2.6	2.6	1 68366454		4 562628782		OFF-21	06/15/98
2,4'-DDD	53190	UG/KG	5 / 12	0 3	0.39	0 148288464	J	0 692199747		OFF-13	06/10/98
2,4'-DDT	789026	UG/KG	11 / 12	0.53	0.53	0.157598832	J	0.78735389	J	OFF-13	06/10/98
2,4,4'-TRICHLOROBIPHENYLS (28)	7012375	UG/KG	12 / 12	3.1	3 1	0 300658168	J	30.42037199		OFF-17	06/10/98
4,4'-DDD	72548	UG/KG	12 / 12	0.83	0.83	0.30420362	J	1.567613196	J	OFF-18	06/08/98
4,4'-DDE	72559	UG/KG	12 / 12	9.3	9.3	4.154377134		22.04870756		OFF-13	06/10/98
4,4'-DDT	50293	UG/KG	10 / 12	0 32	0.3	0 064121351	J	0.627458704	J	OFF-16	06/10/98
44 (2,2'3,5')	41464395	UG/KG	1 / 12	0 15	0 31	0.313312312		0.313312312		OFF-17	06/10/98
66 (2,3'4,4')	32598100	UG/KG	12 / 12	3 5	3.5	1 777635581		9.612363582		OFF-17	06/10/98
8 (2,4)	PCB8	UG/KG	9 / 12	0.91	1	0.364133162	J	4.381283772		OFF-17	06/10/98
ALPHA-CHLORDANE	5103719	UG/KG	12 / 12	0.44	0.44	0.163579234	J	1.344033258		OFF-13	06/10/98
DECACHLOROBIPHENYL (209)	2051243	UG/KG	12 / 12	0.75	0 75	0.475663448	J	1.114938321		OFF-16	06/10/98
DIELDRIN	60571	UG/KG	12 / 12	3.7	3.7	2.495594357		6.273958064		OFF-13	06/10/98
ENDOSULFAN II	33213659	UG/KG	12 / 12	0.6	0.6	0.200814155	J	0.84373656		OFF-21	06/15/98
GAMMA-BHC	58899	UG/KG	11 / 12	1.1	1.2	0.596943126		1.895637692		OFF-18	06/08/98

TABLE 4-7C (continued)
LOBSTER ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	CasNo	Units	Det. Freq	Average of All Data	Average of Detects	Minimum Detected		Maximum Detected		Location of Maximum Detected	Date of Max Detect
HEPTACHLOR EPOXIDE	1024573	UG/KG	1 / 12	0 13	0 084	0 084337683	J	0 084337683	J	OFF-19	06/08/98
HEXACHLOROBENZENE	118741	UG/KG	12 / 12	0 37	0 37	0 257337723		0.547834658		OFF-18	06/08/98
MIREX	2385855	UG/KG	4 / 12	0 22	0.34	0.16616946	J	0 497561804		OFF-19	06/08/98
PCB 103	TBD	UG/KG	12 / 12	22	22	16.60696385		33 23083491		OFF-21	06/08/98
PCB 112	TBD	UG/KG	12 / 12	23	23	16.14901092		32 90872599		OFF-19	06/08/98
PCB 166	TBD	UG/KG	12 / 12	47	47	24.85323695		66 41699108		OFF-21	06/08/98
PCB 200	40186718	UG/KG	5 / 12	0 27	0 33	0 143822649	J	0.600305888		OFF-23	06/08/98
PCB 34	TBD	UG/KG	12 / 12	23	23	17 22488038		33 1767424		OFF-21	06/08/98
PCB 87	38380028	UG/KG	11 / 12	0 46	0 47	0.242790724	J	0.879600691		OFF-17	06/10/98
SUM OF PCB CONGENERS	SUMPCBC	UG/KG	12 / 12	120	120	71.25997362		179 6931615		OFF-21	06/15/98
SUM OF PCB CONGENERS X 2	SUMPCBCX2	UG/KG	12 / 12	240	240	142.5199472		359 386323		OFF-21	06/15/98
TRANS-NONACHLOR	TRANSNON	UG/KG	11 / 12	0.38	0.4	0 191381665	J	0 690495959		OFF-13	06/10/98

TABLE 4-7D
CUNNER FISH ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect
CUNNER FISH - METALS RESULTS								
ALUMINUM	UG/KG	4 / 4	129	129	115 9	141.6	OFF-2	07/20/98
ARSENIC	UG/KG	4 / 4	4 5	4 5	3 9	5 2	OFF-2	07/20/98
CADMIUM	UG/KG	4 / 4	2.6	2 6	2 3	2 9	OFF-2, OFF-4	07/20/98, 07/17/98
CHROMIUM	UG/KG	4 / 4	28 1	28 1	21 7	36.9	OFF-1	07/22/98
COPPER	UG/KG	4 / 4	29 5	29 5	25 6	32 4	OFF-1	07/22/98
IRON	UG/KG	4 / 4	70 7	70 7	66 4	78.1	OFF-1	07/22/98
LEAD	UG/KG	4 / 4	4 8	4 8	4 4	5.1	OFF-2	07/20/98
SILVER	UG/KG	4 /. 4	0.9	0.9	0 8	1	OFF-2	07/20/98
ZINC	UG/KG	4 / 4	21 4	21 4	18 1	23 9	OFF-3	07/20/98
CUNNER FISH - SEMI-VOLATILE ORGANIC COMPOUNDS RESULTS								
1,1'-BIPHENYL	UG/KG	3 / 4	1.8	1 4	0.762729459	1 782789193	OFF-3	07/20/98
1-METHYLNAPHTHALENE	UG/KG	2 / 4	4 6	7.5	7 278364524	7 680395561	OFF-4	07/17/98
2,6-DIMETHYLNAPHTHALENE	UG/KG	4 / 4	2 9	2 9	1 443131133	5 865101769 J	OFF-4	07/17/98
2-METHYLNAPHTHALENE	UG/KG	2 / 4	7 4	12	10.98969285	13 12234027	OFF-4	07/17/98
ACENAPHTHENE	UG/KG	3 / 4	3.3	3 4	2 347406466	4.564333613	OFF-1	07/22/98
ACENAPHTHYLENE	UG/KG	2 / 4	1.4	1.1	0 754596639	1.436350463 J	OFF-1	07/22/98
ANTHRACENE	UG/KG	2 / 4	0.94	0.77	0 604247233 J	0.944331228 J	OFF-3	07/20/98
BENZO(A)ANTHRACENE	UG/KG	2 / 4	1 6	0 47	0 379219769 J	0 558006791 J	OFF-3	07/20/98
BENZO(E)PYRENE	UG/KG	2 / 4	1 8	0 93	0 728814095 J	1 129312695 J	OFF-3	07/20/98
CHRYSENE	UG/KG	3 / 4	1 2	1.4	0.707515608	2 329890663 J	OFF-4	07/17/98
FLUORANTHENE	UG/KG	4 / 4	3.5	3 5	2 836935729	5 417103518 J	OFF-4	07/17/98
FLUORENE	UG/KG	3 / 4	1 9	1 8	1.542502395	2 200484887	OFF-1	07/22/98
NAPHTHALENE	UG/KG	1 / 4	11	31	30.96446118	30 96446118	OFF-4	07/17/98
PERYLENE	UG/KG	3 / 4	11	14	5 291111546	19 84794613	OFF-4	07/17/98
PHENANTHRENE	UG/KG	1 / 4	2.6	5.9	5 936209305	5.936209305	OFF-4	07/17/98
PYRENE	UG/KG	1 / 4	2 1	5 3	5 264966913 J	5 264966913 J	OFF-4	07/17/98
TOTAL PAH	UG/KG	4 / 4	61	61	36 68433591	96 42841531	OFF-4	07/17/98

TABLE 4-7D (continued)
CUNNER FISH ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 3

Parameter	Units	Det Freq	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect
CUNNER FISH - PESTICIDE/PCB RESULTS								
101 (2 2'4 5 5')	UG/KG	4 / 4	24	24	15 05137973	31 98553263	OFF-1	07/22/98
138 (2,2',3,4,4',5)	UG/KG	4 / 4	110	110	79.22006326	137.0971017	OFF-2	07/20/98
153 (2,2',4,4',5,5')	UG/KG	4 / 4	160	160	120 0540156	216 6320661	OFF-2	07/20/98
187 (2,2',3,4',5,5',6)	UG/KG	4 / 4	49	49	36 06970771	63 16413247	OFF-2	07/20/98
195 (2,2',3,3',4,4',5,6)	UG/KG	4 / 4	5 1	5 1	3 725110429	6 569991861	OFF-4	07/17/98
2,2',3,3',4,4',5,5',6-NONACHLOROBIPHENYL	UG/KG	4 / 4	3	3	2 104555954	4 348752454	OFF-2	07/20/98
2,2',3,3',4,4',5-HEPTACHLOROBIPHENYL (170)	UG/KG	4 / 4	24	24	18 45854844	28.02113136	OFF-4	07/17/98
2,2',3,3',4,4'-HEXACHLOROBIPHENYL	UG/KG	4 / 4	8 9	8.9	5 098252007	11.93156753	OFF-2	07/20/98
2,2',3,4,4',5,5'-HEPTACHLOROBIPHENYL (180)	UG/KG	4 / 4	56	56	38 97526292	77.13570075	OFF-2	07/20/98
2,2',5,5'-TETRACHLOROBIPHENYL	UG/KG	4 / 4	8 7	8.7	7 096189744	11.44778035	OFF-1	07/22/98
2,3',4,4',5-PENTACHLOROBIPHENYL (118)	UG/KG	4 / 4	48	48	36 04496642	58 77705086	OFF-4	07/17/98
2,3,3',4,4'-PENTACHLOROBIPHENYL (105)	UG/KG	4 / 4	8 5	8 5	5 167836884	10 98558356	OFF-4	07/17/98
2,4'-DDD	UG/KG	3 / 4	1.8	2	1.099441061	3 123522157	OFF-1	07/22/98
2,4'-DDT	UG/KG	4 / 4	2.7	2 7	2.062805028	3 168955206	OFF-1	07/22/98
2,4,4'-TRICHLOROBIPHENYLS (28)	UG/KG	3 / 4	1 4	1 7	1 228440916	2 357808419	OFF-1	07/22/98
4,4'-DDD	UG/KG	4 / 4	8	8	5.597716793	11 56595633	OFF-1	07/22/98
4,4'-DDE	UG/KG	4 / 4	37	37	31 02557727	45.15396082	OFF-1	07/22/98
4,4'-DDT	UG/KG	4 / 4	11	11	7 442895373	12 94030608	OFF-1	07/22/98
44 (2,2'3,5')	UG/KG	2 / 4	1 1	1 9	1 80230243	1 928128858	OFF-1	07/22/98
66 (2,3'4,4')	UG/KG	3 / 4	1 8	1 7	0 694541595 J	2 753361805	OFF-1	07/22/98
8 (2,4)	UG/KG	4 / 4	16	16	13.33173379	18.07675415	OFF-4	07/17/98
ALPHA-CHLORDANE	UG/KG	4 / 4	6 4	6.4	3.6302004	7.97156412	OFF-1	07/22/98
DECACHLOROBIPHENYL (209)	UG/KG	4 / 4	3.3	3.3	2.356607843	5 014552092	OFF-4	07/17/98
DIELDRIN	UG/KG	4 / 4	6 7	6.7	4 218366824 J	9 798865645	OFF-1	07/22/98
ENDOSULFAN II	UG/KG	4 / 4	5 4	5 4	3 530272773	6.384966071	OFF-1	07/22/98
GAMMA-BHC	UG/KG	3 / 4	0 39	0 39	0.204740153	0 550672361	OFF-1	07/22/98
HEPTACHLOR EPOXIDE	UG/KG	3 / 4	0 75	0 79	0 544923791 J	0 997415009 J	OFF-1	07/22/98
HEXACHLOROBENZENE	UG/KG	4 / 4	1.7	1 7	1.014251218	2.739401097	OFF-1	07/22/98

TABLE 4-7D (continued)
CUNNER FISH ANALYSIS SUMMARY
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Parameter	Units	Det. Freq.	Average of All Data	Average of Detects	Minimum Detected	Maximum Detected	Location of Maximum Detected	Date of Max Detect
PCB 103	UG/KG	4 / 4	46	46	15.52981451	105.038249	OFF-4	07/17/98
PCB 112	UG/KG	4 / 4	46	46	15.40574835	105.9990484	OFF-4	07/17/98
PCB 166	UG/KG	4 / 4	110	110	34.81229951	232.1551894	OFF-4	07/17/98
PCB 34	UG/KG	4 / 4	46	46	14.38053097	107.1428571	OFF-4	07/17/98
PCB 87	UG/KG	4 / 4	5.2	5.2	2.479777461 J	7.889351064	OFF-1	07/22/98
SUM OF PCB CONGENERS	UG/KG	4 / 4	540	540	404.5568315	663.7650936	OFF-2	07/20/98
SUM OF PCB CONGENERS X 2	UG/KG	4 / 4	1100	1100	809.1136631	1327.530187	OFF-2	07/20/98
TRANS-NONACHLOR	UG/KG	4 / 4	9	9	6.685553448	10.70980702	OFF-2	07/20/98

TABLE 5-1
PROPERTIES FOR SELECTED PETROLEUM HYDROCARBONS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Compound	Solubility (mg/L)	Henry's Constant (atm m^3/mol)	K_{ow} (dimensionless)
Benzene	1750	10^{-3}	130
Toluene	535	10^{-3}	130
Ethylbenzene	152	10^{-3}	1400
o-xylene	175	NA	890
Benzo(a)pyrene	0.003	NA	3,200,000
Dibenzo(a,h)anthracene	0.00005	10^{-8}	3,200,000
Acenaphthene	3.4	10^{-5}	10,000
Chrysene	0.0015	10^{-6}	400,000

NA = Data not available

TABLE 6-1
SELECTION OF EXPOSURE PATHWAYS - OFFTA/KATY FIELD
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Populations	Receptor Age	Exposure Routes	On Site/ Off Site	Type of Analysis	Rationale
Current/ Future	Surface Soil	Surface Soil	Contact with OFFTA/Katy Field Surface Soil, Recreational Child, Age 1 - 4	Other Recreational Person	Child	Ingestion	On Site	Quant	Receptor activity patterns could result in exposure
		Surface Soil	Contact with OFFTA/Katy Field Surface Soil, Recreational Child, Age 1 - 4	Other Recreational Person	Child	Dermal Absorption	On Site	Quant	Receptor activity patterns could result in exposure
		Particulates	Inhalation of Particulates in OFFTA/Katy Field Surface Soil, Recreational Child, Age 1 - 4	Other Recreational Person	Child	Inhalation	On Site	Quant	Receptor activity patterns could result in exposure
		Air	Inhalation of Volatiles in OFFTA/Katy Field Surface Soil, Recreational Child, Age 1 - 4	Other Recreational Person	Child	Inhalation	On Site	None	No significant VOCs were detected in OFFTA/Katy Field surface soil
		Surface Soil	Contact with OFFTA/Katy Field Surface Soil, Recreational Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Ingestion	On Site	Quant	Receptor activity patterns could result in exposure
		Surface Soil	Contact with OFFTA/Katy Field Surface Soil, Recreational Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Dermal Absorption	On Site	Quant	Receptor activity patterns could result in exposure
		Particulates	Inhalation of Particulates in OFFTA/Katy Field Surface Soil, Recreational Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Inhalation	On Site	Quant	Receptor activity patterns could result in exposure
		Air	Inhalation of Volatiles in OFFTA/Katy Field Surface Soil, Recreational Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Inhalation	On Site	None	No significant VOCs were detected in OFFTA/Katy Field surface soil
		Surface Soil	Contact with OFFTA/Katy Field Surface Soil, Recreational Adult	Other Recreational Person	Adult	Ingestion	On Site	Quant	Receptor activity patterns could result in exposure
		Surface Soil	Contact with OFFTA/Katy Field Surface Soil, Recreational Adult	Other Recreational Person	Adult	Dermal Absorption	On Site	Quant	Receptor activity patterns could result in exposure
		Particulates	Inhalation of Particulates in OFFTA/Katy Field Surface Soil, Recreational Adult	Other Recreational Person	Adult	Inhalation	On Site	Quant	Receptor activity patterns could result in exposure
		Air	Inhalation of Volatiles in OFFTA/Katy Field Surface Soil, Recreational Adult	Other Recreational Person	Adult	Inhalation	On Site	None	No significant VOCs were detected in OFFTA/Katy Field surface soil
	Sediment	Sediment	Contact with OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 1 - 4	Other Recreational Person	Child	Ingestion	On Site	Quant	Receptor activity patterns could result in exposure
		Sediment	Contact with OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 1 - 4	Other Recreational Person	Child	Dermal Absorption	On Site	Quant	Receptor activity patterns could result in exposure
		Particulates	Inhalation of Particulates in OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 1 - 4	Other Recreational Person	Child	Inhalation	On Site	None	OFFTA/Katy Field sediment is expected to be wet, resulting in no exposure
		Air	Inhalation of Volatiles in OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 1 - 4	Other Recreational Person	Child	Inhalation	On Site	None	No significant VOCs were detected in OFFTA/Katy Field sediment
		Sediment	Contact with OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Ingestion	On Site	Quant	Receptor activity patterns could result in exposure
		Sediment	Contact with OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Dermal Absorption	On Site	Quant	Receptor activity patterns could result in exposure
		Particulates	Inhalation of Particulates in OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Inhalation	On Site	None	OFFTA/Katy Field sediment is expected to be wet, resulting in no exposure
		Air	Inhalation of Volatiles in OFFTA/Katy Field Sediment, Shoreline Visitor Child, Age 5 - 12	Other Recreational Person	Pre-Adolescents	Inhalation	On Site	None	No significant VOCs were detected in OFFTA/Katy Field sediment

TABLE 6-2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium· Surface Soil
Exposure Point: Ingestion, Dermal Contact, and Inhalation of Dust

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
1746-01-6	Total 2,3,7,8-TCDD Equiv.	0 000751		0 016388		ug/kg	OFF-SS-308-0001	7/7	N/A	0 016388	0 0043 C	Y	ASL
7429-90-5	Aluminum	1370		12200		mg/kg	OFF-SS-306-0001	76/76	N/A	12200		N	NTX
7440-36-0	Antimony	0 58	J	9 1	J	mg/kg	OFF-M111-112993	10/76	0 46-6 4	9 1	3 1 N	N	BKG
7440-38-2	Arsenic	1 5		10 4		mg/kg	OFF-SS-325-0001	76/76	N/A	10 4	0.43 C	Y	ASL
7440-39-3	Barium	8		282		mg/kg	OFF-M111-112993	72/76	2 3-6 7	282	550 N	N	BSL
7440-41-7	Beryllium	0.22		0 6		mg/kg	OFF-SS-305-0001	60/76	0 18-0 63	0 6	16 N	N	BSL
7440-43-9	Cadmium	0.72		0 94		mg/kg	OFF-SS4-411	3/76	0 07-0 81	0.94	7.8 N	N	BSL
7440-70-2	Calcium	325		21000		mg/kg	OFF-SS4-411	63/76	157-2270	21000	0 N	N	NUT
7440-47-3	Chromium	1 4	J	37 9		mg/kg	OFF-SS-313-0001	76/76	N/A	37 9	23 N	Y	ASL
7440-48-4	Cobalt	1 8		20		mg/kg	OFF-SS6-411	67/76	1 1-6 4	20		N	NTX
7440-50-8	Copper	2 4	J	220		mg/kg	OFF-M111-112993	75/76	1 9-2 2	220		N	NTX
7439-89-6	Iron	3480		107000		mg/kg	OFF-SS-313-0001	76/76	N/A	107000		N	NTX
7439-92-1	Lead	2 4	J	2970		mg/kg	OFF-M111-112993	75/76	12.4-12.4	2970	400 C	Y	ASL
7439-95-4	Magnesium	503		7340		mg/kg	OFF-SS4-411	76/76	N/A	7340		N	NUT
7439-96-5	Manganese	71.1		750		mg/kg	OFF-SS6-411	76/76	N/A	750	160 N	Y	ASL
7439-97-6	Mercury	0 05	J	0 61		mg/kg	OFF-SS18-110393	32/76	0 05-0 14	0 61	0 78 N	N	BSL
7440-02-0	Nickel	2 2	J	221		mg/kg	OFF-M111-112993	66/76	1 8-16 6	221	160 N	Y	ASL
7440-09-7	Potassium	168		1270		mg/kg	OFF-SS-303-0001	68/76	163-300	1270		N	NUT
7782-49-2	Selenium	0.46		0 66	J	mg/kg	OFF-SS-317-0001	8/76	0 225-0 77	0.66	39 N	N	BSL
7440-22-4	Silver	0 68		26 5	J	mg/kg	OFF-SS-313-0001	22/76	0.31-6	26 5	39 N	N	BSL
7440-23-5	Sodium	49		907		mg/kg	OFF-SS6-411	7/76	43.8-461	907		N	NUT
7440-62-2	Vanadium	2.8	J	41 2		mg/kg	OFF-B101-112393	76/76	N/A	41 2	55 N	N	BSL
7440-66-6	Zinc	13 2		1910	J	mg/kg	OFF-M111-112993	75/76	42 8-42.8	1910	2300 N	N	BSL
72-54-8	4,4'-DDD	0 82	J	17	J	ug/kg	OFF-B161-112393	21/39	3.5-18	17	2700 C	N	BSL
72-55-9	4,4'-DDE	0.41	J	42		ug/kg	OFF-SS17-110393	36/39	3.7-18	42	1900 C	N	BSL
50-29-3	4,4'-DDT	2.3	J	74		ug/kg	OFF-SS17-110393	36/39	7 4-28	74	1900 C	N	BSL
309-00-2	Aldrin	0 059	J	1 5	J	ug/kg	OFF-SS15-110393	3/39	1 8-230	1.5	38 C	N	BSL
319-84-6	Alpha-BHC	0.048	J	1 7	J	ug/kg	OFF-SS23-110493	4/39	1 8-9 2	1 7	100 C	N	BSL
5103-71-9	Alpha-Chlordane	0.33	J	14		ug/kg	OFF-SS18-110393	14/39	1 8-92	14	1800 C	N	BSL
11097-69-1	Aroclor-1254	80		530		ug/kg	OFF-M101-112993	2/39	35-180	530	320 C	Y	ASL
319-85-7	Beta-BHC	0 27	J	0.99	J	ug/kg	OFF-SS17-110393	3/39	1 8-9 2	0 99	350 C	N	BSL
60-57-1	Dieldrin	0.47	J	11	J	ug/kg	OFF-SS18-110393	17/39	3 3-100	11	40 C	N	BSL

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

CAS Number	Chemical	Minimum [(1)] Concentration	Minimum Qualifier	Maximum [(1)] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening [(3)] Toxicity Value	COPC Flag	Rationale for [(4)] Contaminant Deletion or Selection
959-98-8	Endosulfan I	0 35	J	9 4	J	ug/kg	OFF-B161-112393	7/39	1 8-9.2	9.4	47000 N	N	BSL
33213-65-9	Endosulfan II	0 024	NJ	25	NJ	ug/kg	OFF-B161-112393	18/39	3 5-19	25	47000 N	N	BSL
1031-07-8	Endosulfan Sulfate	0 3	NJ	33	J	ug/kg	OFF-B161-112393	11/39	3.5-22	33	47000 N	N	BSL
72-20-8	Endrin	0 59	NJ	74	J	ug/kg	OFF-B161-112393	27/39	3 6-50	74	2300 N	N	BSL
7421-93-4	Endrin Aldehyde	1 4	NJ	25	NJ	ug/kg	OFF-M101-112993	18/33	2 1-37	25	2300 N	N	BSL
53494-70-5	Endrin Ketone	2 9	J	2 9	J	ug/kg	OFF-SS12-110393	1/39	3 5-18	2 9	2300 N	N	BSL
58-89-9	Gamma-BHC (Lindane)	0 054	NJ	2 4	J	ug/kg	OFF-M91-120193-D	9/39	1 9-9 2	2 4	490 C	N	BSL
5103-74-2	Gamma-Chlordane	0 076	NJ	7 8		ug/kg	OFF-SS18-110393	13/39	1 8-92	7 8	1800 C	N	BSL
76-44-8	Heptachlor	0 27	J	0 74	J	ug/kg	OFF-SS27-110493-D	3/39	1.8-16	0 74	140 C	N	BSL
1024-57-3	Heptachlor Epoxide	0.06	NJ	8 1	J	ug/kg	OFF-B161-112393	24/39	1 8-34	8 1	70 C	N	BSL
72-43-5	Methoxychlor	1 4	J	10	J	ug/kg	OFF-B181-112393	8/39	18-92	10	39000 N	N	BSL
91-57-6	2-Methylnaphthalene	41	J	660		ug/kg	OFF-M101-112993	9/71	10-3800	660	160000 N	N	BSL
59-50-7	4-Chloro-3-methylphenol	68	J	140	J	ug/kg	OFF-SS-326-0001	3/71	10-3800	140		Y	NTX
83-32-9	Acenaphthene	37	J	940		ug/kg	OFF-SS6-411	12/71	10-3800	940	470000 N	N	BSL
208-96-8	Acenaphthylene	37	J	140	J	ug/kg	OFF-B121-112493	6/71	10-3800	140	310000 N	N	BSL
120-12-7	Anthracene	42	J	3800		ug/kg	OFF-SS-314-0001	21/71	10-3800	3800	2300000 N	N	BSL
56-55-3	Benz(a)anthracene	42	J	9100		ug/kg	OFF-SS-314-0001	43/70	10-1800	9100	870 C	Y	ASL
50-32-8	Benzo(a)pyrene	41	J	7100		ug/kg	OFF-SS-314-0001	42/71	10-1800	7100	87 C	Y	ASL
205-99-2	Benzo(b)fluoranthene	36	J	9700		ug/kg	OFF-SS-314-0001	52/70	10-520	9700	870 C	Y	ASL
191-24-2	Benzo(g,h,i)perylene	41	J	4300		ug/kg	OFF-SS-314-0001	29/71	10-1800	4300	310000 N	N	BSL
207-08-9	Benzo(k)fluoranthene	64	J	3500	J	ug/kg	OFF-SS-314-0001	15/71	10-1800	3500	8700 C	Y	PAH
117-81-7	Bis(2-ethylhexyl)phthalate	42	J	3200	J	ug/kg	OFF-SS-332-0001	15/71	10-3800	3200	46000 C	N	BSL
86-74-8	Carbazole	56	J	930	J	ug/kg	OFF-SS-314-0001	9/65	340-3800	930	32000 C	Y	PAH
218-01-9	Chrysene	37	J	8100		ug/kg	OFF-SS-314-0001	46/70	10-1800	8100	87000 C	Y	PAH
84-74-2	Di-n-butylphthalate	37	J	170	J	ug/kg	OFF-SS19-110393	17/71	10-3800	170	780000 N	N	BSL
117-84-0	Di-n-octylphthalate	54	J	54	J	ug/kg	OFF-M101-112993	1/71	10-3800	54	160000 N	N	BSL
53-70-3	Dibenz(a,h)anthracene	42	J	610		ug/kg	OFF-B121-112493	11/71	10-3800	610	87 C	Y	ASL
132-64-9	Dibenzofuran	38	J	650		ug/kg	OFF-SS6-411	8/71	10-3800	650	31000 N	N	BSL
206-44-0	Fluoranthene	38	J	15000		ug/kg	OFF-SS-314-0001	56/70	10-500	15000	310000 N	N	BSL
86-73-7	Fluorene	47	J	1200		ug/kg	OFF-SS6-411	13/71	10-3800	1200	310000 N	N	BSL
118-74-1	Hexachlorobenzene	43	J	210	J	ug/kg	OFF-B181-112393	2/71	10-3800	210	400 C	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	42	J	4100		ug/kg	OFF-SS-314-0001	30/71	10-1800	4100	870 C	Y	ASL
86-30-6	N-Nitrosodiphenylamine (1)	150	J	150	J	ug/kg	OFF-B121-112493	1/71	10-3800	150	130000 C	N	BSL
91-20-3	Naphthalene	39	J	740		ug/kg	OFF-SS20-110393	7/71	10-3800	740	160000 N	N	BSL
87-86-5	Pentachlorophenol	350	J	350	J	ug/kg	OFF-B161-112393	1/71	25-11000	350	5300 C	N	BSL

TABLE 6-2.1 (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value		COPC Flag	Rationale for (4) Contaminant Deletion or Selection
85-01-8	Phenanthrene	43	J	9700		ug/kg	OFF-SS-314-0001	45/70	10-1800	9700	160000	N	N	BSL
108-95-2	Phenol	60	J	60	J	ug/kg	OFF-M81-113093	1/71	10-3800	60	4700000	N	N	BSL
129-00-0	Pyrene	40	J	12000		ug/kg	OFF-SS-314-0001	59/70	10-500	12000	230000	N	N	BSL
71-55-6	1,1,1-Trichloroethane	2	J	2	J	ug/kg	OFF-SS23-110493	1/67	3-18	2	2200000	N	N	BSL
540-59-0	1,2-Dichloroethene (Total)	17		17		ug/kg	OFF-B141-121393	1/67	4-18	17	70000	N	N	BSL
78-93-3	2-Butanone	1	J	13		ug/kg	OFF-SS-306-0001	15/61	9-28	13	4700000	N	N	BSL
591-78-6	2-Hexanone	32		32		ug/kg	OFF-SS-330-0001	1/67	9-18	32	310000	N	N	BSL
67-64-1	Acetone	2	J	320	J	ug/kg	OFF-SS-325-0001	23/67	5-1900	320	780000	N	N	BSL
74-83-9	Bromomethane	1	J	1	J	ug/kg	OFF-SS-315-0001	2/67	4-18	1	11000	N	N	BSL
75-15-0	Carbon Disulfide	2	J	2	J	ug/kg	OFF-SS-314-0001	1/67	4-18	2	780000	N	N	BSL
74-87-3	Chloromethane	1	J	1	J	ug/kg	OFF-SS-304-0001	3/67	4-18	1	49000	C	N	BSL
75-09-2	Methylene Chloride	1	J	4	J	ug/kg	OFF-SS-324-0001	37/67	5-18	4	85000	C	N	BSL
127-18-4	Tetrachloroethene	1	J	16		ug/kg	OFF-B101-112393	3/67	4-18	16	12000	C	N	BSL
108-88-3	Toluene	2	J	4	J	ug/kg	OFF-SS-312-0001	5/67	3-12	4	1600000	N	N	BSL
79-01-6	Trichloroethene	1	J	1	J	ug/kg	OFF-SS17-110393	1/67	3-18	1	58000	C	N	BSL
75-01-4	Vinyl Chloride	3	J	3	J	ug/kg	OFF-B141-121393	1/67	4-18	3	340	C	N	BSL
1330-20-7	Xylene (Total)	1	J	3	J	ug/kg	OFF-SS14-110393	6/67	3-12	3	16000000	N	N	BSL

Notes
(1) Minimum/maximum detected concentration
(2) N/A - Refer to supporting information for background discussion.
Background values derived from statistical analysis. Follow Regional guidance and provide supporting information.
(3) Screening toxicity values from EPA Region 3 risk based concentration for residential exposure to soil, April 2000.
(4) Rationale Codes Selection Reason. Compound belong to same class as other carcinogenic Polyaromatic Hydrocarbons (PAHs) found above screening levels
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

TABLE 6-2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Ingestion, Dermal Contact, and Inhalation of Dust

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
7429-90-5	Aluminum	3030		20700		mg/kg	OFF-M72-112993	50/50	N/A	20700		N	NTX
7440-36-0	Antimony	4	J	39 2	J	mg/kg	OFF-S-TP-13-0607	9/34	0 36-9 5	39 2	3.1 N	Y	ASL
7440-38-2	Arsenic	1.3	J*	74 4	J	mg/kg	OFF-S-TP-16-1011	50/50	N/A	74 4	0 43 C	Y	ASL
7440-39-3	Barium	4 9		220		mg/kg	OFF-S-MW102-0608	50/50	N/A	220	550 N	N	BSL
7440-41-7	Beryllium	0 2		0 48	B1	mg/kg	FF-M32-424	23/39	0 15-0 46	0.48	16 N	N	BSL
7440-43-9	Cadmium	0 25	J	8 1		mg/kg	FF-M21-423	11/38	0 03-6 3	8.1	7 8 N	N	BKG
7440-70-2	Calcium	523		91300		mg/kg	FF-B011-418	50/50	N/A	91300		N	NUT
7440-47-3	Chromium	5 4		61 9		mg/kg	OFF-S-TP-16-1011	50/50	N/A	61.9	23 N	Y	ASL
7440-48-4	Cobalt	2.8		20.5	J*	mg/kg	FF-B062-419	50/50	N/A	20 5		N	NTX
7440-50-8	Copper	6.1		2310		mg/kg	OFF-S-MW102-0608	49/50	12-12	2310		N	NTX
7439-89-6	Iron	5230		204000		mg/kg	OFF-S-MW102-0608	50/50	N/A	204000		N	NTX
7439-92-1	Lead	2 2	J*	7820	J	mg/kg	OFF-S-TP-13-0607	49/49	N/A	7820	400 C	Y	ASL
7439-95-4	Magnesium	602	J*	7770		mg/kg	OFF-S-MW102-0608	50/50	N/A	7770		N	NUT
7439-96-5	Manganese	70 7		1110	J	mg/kg	OFF-S-TP-16-1011	50/50	N/A	1110	160 N	Y	ASL
7439-97-6	Mercury	0 06	J	2 2	J	mg/kg	OFF-S-TP-16-1011	26/37	0.01-0 06	2.2	0 78 N	Y	ASL
7440-02-0	Nickel	4 3	B	64 1		mg/kg	OFF-S-MW102-0608	50/50	N/A	64 1	160 N	N	BSL
7440-09-7	Potassium	184		1030	B	mg/kg	OFF-B153-121393	41/50	268-481	1030		N	NUT
7782-49-2	Selenium	0 39	J*	1.7	B1	mg/kg	FF-M31-424	18/40	0.34-0 69	1.7	39 N	N	BSL
7440-23-5	Sodium	56 6		3820		mg/kg	FF-B052-417	33/50	44 4-385	3820		N	NUT
7440-62-2	Vanadium	7 4	B	57		mg/kg	OFF-M72-112993	47/50	4 6-16.2	57	55 N	Y	ASL
7440-66-6	Zinc	23 6	J*	4240		mg/kg	OFF-S-TP-16-1011	47/50	39 4-52 3	4240	2300 N	Y	ASL
72-54-8	4,4'-DDD	9.1	J	89	J	ug/kg	OFF-TP33-011294	5/33	2 1-18	89	2700 C	N	BSL
72-55-9	4,4'-DDE	0 13	J	67	J	ug/kg	OFF-M112-112993	8/33	1.9-7 2	67	1900 C	N	BSL
50-29-3	4,4'-DDT	0.61	J	370		ug/kg	OFF-M112-112993	11/33	2.1-11	370	1900 C	N	BSL
319-84-6	Alpha-BHC	0.045	J	2.5	J	ug/kg	OFF-M112-112993	4/33	1.6-9.2	2.5	100 C	N	BSL
5103-71-9	Alpha-Chlordane	4 8	J	10	NJ	ug/kg	OFF-M112-112993	2/33	1.1-9 2	10	1800 C	N	BSL
11097-69-1	Aroclor-1254	95	J	190	J	ug/kg	OFF-B153-121393	2/33	21-440	190	320 C	N	BSL
11096-82-5	Aroclor-1260	39	J	39	J	ug/kg	OFF-B172-112493	1/33	21-440	39	320 C	N	BSL
319-86-8	Delta-BHC	2 4	J	2.4	J	ug/kg	OFF-TP31-011194	1/33	1 1-23	2 4		Y	NTX
60-57-1	Dieldrin	1 5	NJ	44	J	ug/kg	OFF-M112-112993	2/33	2 1-63	44	40 C	Y	ASL
959-98-8	Endosulfan I	4	J	5.4	J	ug/kg	OFF-TP33-011294	3/33	1 1-23	5.4	47000 N	N	BSL
33213-65-9	Endosulfan II	0 3	NJ	13	J	ug/kg	OFF-B162-112393	12/33	2 1-44	13	47000 N	N	BSL

TABLE 6-2.2 (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
1031-07-8	Endosulfan Sulfate	1 1	NJ	17	J	ug/kg	OFF-B162-112393	3/33	2.1-44	17	47000 N	N	BSL
72-20-8	Endrin	5.3	J	120	J	ug/kg	OFF-M112-112993	6/33	2 1-40	120	2300 N	N	BSL
7421-93-4	Endrin Aldehyde	5.2	J	16	J	ug/kg	OFF-M102-112993	3/33	2 1-390	16	2300 N	N	BSL
58-89-9	Gamma-BHC (Lindane)	0 28	J	3 1	NJ	ug/kg	OFF-M112-112993	3/33	1 1-9.2	3 1	490 C	N	BSL
5103-74-2	Gamma-Chlordane	0 062	NJ	2 5	J	ug/kg	OFF-B153-121393	3/33	1 1-23	2 5	1800 C	N	BSL
76-44-8	Heptachlor	1 4	J	1 4	J	ug/kg	OFF-B153-121393	1/33	1 1-23	1 4	140 C	N	BSL
1024-57-3	Heptachlor Epoxide	0.89	J	43		ug/kg	OFF-M112-112993	10/33	1 1-8 5	43	70 C	N	BSL
72-43-5	Methoxychlor	4	NJ	4	NJ	ug/kg	OFF-B132-112393	1/33	11-230	4	39000 N	N	BSL
91-57-6	2-Methylnaphthalene	77	J	11000		ug/kg	OFF-S-MW101-0608	13/35	360-7700	11000	160000 N	N	BSL
	4,6-Dinitro-2-methylphenol	320	J	320	J	ug/kg	OFF-B152-121393	1/29	870-19000	320		Y	NTX
83-32-9	Acenaphthene	100	J	4900		ug/kg	OFF-S-TP-15-0506	14/36	360-7700	4900	470000 N	N	BSL
208-96-8	Acenaphthylene	47	J	640		ug/kg	OFF-B82-112293	10/31	360-7700	640	160000 N	N	BSL
120-12-7	Anthracene	41	J	4800		ug/kg	OFF-S-MW102-0608	32/43	360-5000	4800	2300000 N	N	BSL
56-55-3	Benz(a)anthracene	52	J	3400		ug/kg	OFF-S-MW102-0608	35/43	360-7700	3400	870 C	Y	ASL
50-32-8	Benzo(a)pyrene	77	J	4000		ug/kg	OFF-S-MW102-0608	32/42	360-7700	4000	87 C	Y	ASL
205-99-2	Benzo(b)fluoranthene	47	J	2800		ug/kg	OFF-B82-112293	34/42	360-7700	2800	870 C	Y	ASL
191-24-2	Benzo(g,h,i)perylene	57	J	1900	J	ug/kg	OFF-S-MW102-0608	22/39	360-7700	1900	160000 N	N	BSL
207-08-9	Benzo(k)fluoranthene	62	J	2500	J	ug/kg	OFF-TP32-011194	22/43	360-7700	2500	8700 C	Y	PAH
65-85-0	Benzoic Acid	48	J	48	J	ug/kg	FF-M32-424	1/2	1900-1900	48	31000000 N	N	BSL
117-81-7	Bis(2-ethylhexyl)phthalate	44	J	110	J	ug/kg	OFF-M112-112993	3/44	220-7700	110	46000 C	N	BSL
85-68-7	Butylbenzylphthalate	120	J	120	J	ug/kg	OFF-B153-121393	1/33	360-7700	120	1600000 N	N	BSL
86-74-8	Carbazole	69	J	220	J	ug/kg	OFF-B153-121393	7/30	360-7700	220	32000 C	Y	PAH
218-01-9	Chrysene	51	J	3200	J	ug/kg	OFF-S-MW102-0608	37/43	360-7700	3200	87000 C	Y	PAH
84-74-2	Di-n-butylphthalate	56	J	1400	*	ug/kg	FF-B033-418	3/38	44-7700	1400	780000 N	N	BSL
53-70-3	Dibenz(a,h)anthracene	60	J	820	J	ug/kg	OFF-S-MW102-0608	19/37	360-7700	820	87 C	Y	ASL
132-64-9	Dibenzofuran	86	J	4000		ug/kg	OFF-S-TP-15-0506	11/33	360-7700	4000	31000 N	N	BSL
206-44-0	Fluoranthene	39	J	16000		ug/kg	OFF-S-MW102-0608	43/47	360-6700	16000	310000 N	N	BSL
86-73-7	Fluorene	120	J	3400	J	ug/kg	OFF-S-TP-11-0506	17/35	360-6700	3400	310000 N	N	BSL
118-74-1	Hexachlorobenzene	370	J	370	J	ug/kg	OFF-B142-121393	1/31	360-7700	370	400 C	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	48	J	2300	J	ug/kg	OFF-S-MW102-0608	29/39	360-7700	2300	870 C	Y	ASL
91-20-3	Naphthalene	41	J	4000		ug/kg	OFF-S-TP-11-0506	10/34	360-7700	4000	160000 N	N	BSL
85-01-8	Phenanthrene	38	J	14000		ug/kg	FF-M22-423	43/47	360-5000	14000	160000 N	N	BSL
108-95-2	Phenol	250	J	490		ug/kg	FF-B072-419	3/22	360-7700	490	4700000 N	N	BSL
129-00-0	Pyrene	70	J	5300		ug/kg	OFF-S-MW102-0608	45/49	360-6700	5300	230000 N	N	BSL
78-93-3	2-Butanone	3	J	1100	J	ug/kg	FF-M21-423	3/37	10-1500	1100	4700000 N	N	BSL
75-15-0	Carbon Disulfide	3	J	11		ug/kg	FF-B051-417	3/38	10-1500	11	780000 N	N	BSL

TABLE 6-2.2 (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
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CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value		COPC Flag	Rationale for (4) Contaminant Deletion or Selection
75-00-3	Chloroethane	1	J	1	J	ug/kg	OFF-B142-121393	1/35	10-1500	1	220000	C	N	BSL
100-41-4	Ethylbenzene	89		630	J	ug/kg	OFF-S-MW102-0608	3/37	10-1500	630	780000	N	N	BSL
75-09-2	Methylene Chloride	1	J	1800	J	ug/kg	OFF-S-TP-11-0506-D	6/53	10-3800	1800	85000	C	N	BSL
108-88-3	Toluene	1	J	67		ug/kg	FF-B061-419	10/39	10-1500	67	1600000	N	N	BSL
1330-20-7	Xylene (Total)	2	J	1200		ug/kg	FF-B061-419	5/37	10-1500	1200	16000000	N	N	BSL

Notes.
(1) Minimum/maximum detected concentration.
(2) N/A - Refer to supporting information for background discussion
Background values derived from statistical analysis Follow Regional guidance and provide supporting information
(3) Screening toxicity values from EPA Region 3 risk based concentration for residential exposure to soil, April 2000
(4) Rationale Codes Selection Reason: Compound belong to same class as other carcinogenic Polyaromatic Hydrocarbons (PAHs) found above screening levels
Above Screening Levels (ASL)
Deletion Reason: Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

TABLE 6-2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium Sediment
Exposure Medium: Sediment
Exposure Point Ingestion, Dermal Contact, and Inhalation of Dust

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening [3] Toxicity Value	COPC Flag	Rationale for [4] Contaminant Deletion or Selection
7429-90-5	Aluminum	7060		10300		mg/kg	OFF-SSD-333-00005	5/5	N/A	10300		N	NTX
7440-36-0	Antimony	0 66	J	0 69	J	mg/kg	OFF-SSD-335-00005	2/5	0 54-0.91	0.69	3 1 N	N	BSL
7440-38-2	Arsenic	3 1	J	7 1		mg/kg	OFF-SSD-337-00005	5/5	N/A	7 1	0 43 C	Y	ASL
7440-39-3	Barium	12.5		15.9		mg/kg	OFF-SSD-335-00005	4/5	7.7-7 7	15 9	550 N	N	BSL
7440-41-7	Beryllium	0 48		0 48		mg/kg	OFF-SSD-337-00005	1/5	0.22-0.33	0.48	16 N	N	BSL
7440-70-2	Calcium	2080	J	33500	J	mg/kg	OFF-SSD-334-00005	5/5	N/A	33500		N	NUT
7440-47-3	Chromium	10 9		15.8		mg/kg	OFF-SSD-337-00005	5/5	N/A	15.8	23 N	N	BSL
7440-48-4	Cobalt	6 1		11 9		mg/kg	OFF-SSD-334-00005	5/5	N/A	11 9	0 N	N	NTX
7440-50-8	Copper	9 4		61 4		mg/kg	OFF-SSD-335-00005	5/5	N/A	61 4	0 N	N	NTX
7439-89-6	Iron	19400		41500		mg/kg	OFF-SSD-337-00005	5/5	N/A	41500	0 N	N	NTX
7439-92-1	Lead	39 4	J	168		mg/kg	OFF-SSD-335-00005	5/5	N/A	168	400 C	N	BSL
7439-95-4	Magnesium	4080		9100		mg/kg	OFF-SSD-333-00005	5/5	N/A	9100		N	NUT
7439-96-5	Manganese	265		1240		mg/kg	OFF-SSD-334-00005	5/5	N/A	1240	160 N	Y	ASL
7440-02-0	Nickel	12 6		50 8		mg/kg	OFF-SSD-336-00005	5/5	N/A	50 8	160 N	N	BSL
7440-09-7	Potassium	476		550		mg/kg	OFF-SSD-335-00005	5/5	N/A	550		N	NUT
7440-22-4	Silver	5 7	J	11 3	J	mg/kg	OFF-SSD-337-00005	4/5	6 4-6 4	11 3	39 N	N	BSL
7440-23-5	Sodium	1450	J	4460	J	mg/kg	OFF-SSD-335-00005	5/5	N/A	4460		N	NUT
7440-62-2	Vanadium	13 9		52 5		mg/kg	OFF-SSD-335-00005	5/5	N/A	52 5	55 N	N	BSL
7440-66-6	Zinc	69 1		228		mg/kg	OFF-SSD-335-00005	5/5	N/A	228	2300 N	N	BSL
208-96-8	Acenaphthylene	230	J	230	J	ug/kg	OFF-SSD-334-00005	1/5	1800-4000	230	160000 N	N	BSL
120-12-7	Anthracene	250	J	600	J	ug/kg	OFF-SSD-334-00005	3/5	4000-4000	600	2300000 N	N	BSL
56-55-3	Benz(a)anthracene	620	J	1900	J	ug/kg	OFF-SSD-334-00005	4/5	4000-4000	1900	870 C	Y	ASL
50-32-8	Benzo(a)pyrene	520	J	1400	J	ug/kg	OFF-SSD-334-00005	4/5	4000-4000	1400	87 C	Y	ASL
205-99-2	Benzo(b)fluoranthene	610	J	1700	J	ug/kg	OFF-SSD-335-00005	3/5	2300-4000	1700	870 C	Y	ASL
191-24-2	Benzo(g,h,i)perylene	310	J	790	J	ug/kg	OFF-SSD-335-00005	3/5	4000-4000	790	160000 N	N	BSL
207-08-9	Benzo(k)fluoranthene	530	J	720	J	ug/kg	OFF-SSD-335-00005	2/5	2300-4000	720	8700 C	Y	PAH
218-01-9	Chrysene	570	J	1700	J	ug/kg	OFF-SSD-334-00005	4/5	4000-4000	1700	87000 C	Y	PAH
53-70-3	Dibenz(a,h)anthracene	290	J	290	J	ug/kg	OFF-SSD-334-00005	1/5	1800-4000	290	87 C	Y	ASL
206-44-0	Fluoranthene	420	J	4400		ug/kg	OFF-SSD-334-00005	5/5	N/A	4400	310000 N	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	430	J	1000	J	ug/kg	OFF-SSD-334-00005	3/5	4000-4000	1000	870 C	Y	ASL
85-01-8	Phenanthrene	810	J	2300		ug/kg	OFF-SSD-335-00005	4/5	4000-4000	2300	160000 N	N	BSL

TABLE 6-2.3 (c ntinued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
129-00-0	Pyrene	480	J	3700		ug/kg	OFF-SSD-334-00005	5/5	N/A	3700	230000 N	N	BSL
78-93-3	2-Butanone	5	J	8	J	ug/kg	OFF-SSD-333-00005	3/5	11-11	8	4700000 N	N	BSL
67-64-1	Acetone	22	J	42	J	ug/kg	OFF-SSD-333-00005	2/5	28-1100	42	780000 N	N	BSL
71-43-2	Benzene	1	J	1	J	ug/kg	OFF-SSD-336-00005	1/5	5-6	1	12000 C	N	BSL
74-83-9	Bromomethane	2	J	2	J	ug/kg	OFF-SSD-336-00005	1/5	5-6	2	11000 N	N	BSL
75-15-0	Carbon Disulfide	2	J	27		ug/kg	OFF-SSD-333-00005	2/5	5-6	27	780000 N	N	BSL
74-87-3	Chloromethane	9		9		ug/kg	OFF-SSD-336-00005	1/5	5-6	9	49000 C	N	BSL
75-09-2	Methylene Chloride	2	J	4	J	ug/kg	OFF-SSD-333-00005	5/5	N/A	4	85000 C	N	BSL

Notes:
(1) Minimum/maximum detected concentration
(2) N/A - Refer to supporting information for background discussion
Background values derived from statistical analysis Follow Regional guidance and provide supporting information.
(3) Screening toxicity values from EPA Region 3 risk based concentration for residential exposure to soil, April, 2000.
(4) Rationale Codes Selection Reason: Compound belong to same class as other carcinogenic Polyaromatic Hydrocarbons (PAHs) found above screening levels
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

TABLE 6-2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN BLUE MUSSELS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Fish
Exposure Medium: Blue Mussels
Exposure Point: Ingestion

CAS Number	Chemical	Minimum [1] Concentration	Minimum Qualifier	Maximum [1] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening [3] Toxicity Value	COPC Flag	Rationale for [4] Contaminant Deletion or Selection
7429-90-5	Aluminum	58 3	J	212 6	J	mg/kg	OFF-7-BM-052698	5/7	20-20	212 6		N	NTX
7440-38-2	Arsenic	0 9		2.7		mg/kg	OFF-5-BM-052698	7/7	N/A	2 7	0.0021 C	Y	ASL
7440-43-9	Cadmium	5		17		mg/kg	OFF-7-BM-052698	7/7	N/A	17	0 14 N	Y	ASL
7440-47-3	Chromium	10 3		40 5		mg/kg	OFF-7-BM-052698	3/7	0 5-0.5	40 5	0 41 N	Y	ASL
7440-50-8	Copper	1.4	J	10		mg/kg	OFF-5-BM-052698	5/7	5-5	10		N	NTX
7439-89-6	Iron	320 6		538 2		mg/kg	OFF-5-BM-052698	7/7	N/A	538 2		N	NTX
7439-92-1	Lead	3		6 3		mg/kg	OFF-3-BM-052698	7/7	N/A	6 3	N	Y	No RBC
7439-97-6	Mercury	1 3		3		mg/kg	OFF-1-BM-052698	7/7	N/A	3	0 014 N	Y	ASL
7440-02-0	Nickel	5 7		12 4		mg/kg	OFF-3-BM-052698	7/7	N/A	12 4	2 7 N	Y	ASL
7440-66-6	Zinc	94		157 3		mg/kg	OFF-2-BM-052698	6/6	N/A	157.3	41 N	Y	ASL
72-55-9	2,4'-DDD	1 908857		3 971987		ug/kg	OFF-7-BM-052698	7/7	N/A	3 971987	13 C	Y	DDT
50-29-3	2,4'-DDT	0.834728	J	2.931549	J	ug/kg	OFF-5-BM-052698	7/7	N/A	2 931549	9 3 C	Y	DDT
72-54-8	4,4'-DDD	4 349797		10 572953		ug/kg	OFF-7-BM-052698	7/7	N/A	10 572953	13 C	Y	DDT
72-55-9	4,4'-DDE	13 041561		19 068304		ug/kg	OFF-7-BM-052698	6/7	2 1544-2 1544	19 068304	9 3 C	Y	ASL
50-29-3	4,4'-DDT	2 409033		5 410711		ug/kg	OFF-3-BM-052698	7/7	N/A	5 410711	9 3 C	Y	DDT
5103-71-9	Alpha-Chlordane	4 010695		4 928442		ug/kg	OFF-2-BM-052698	6/7	0 2435-0 2435	4 928442	9 C	Y	CHLRD
60-57-1	Dieldrin	2 419439		6.414344		ug/kg	OFF-4-BM-052698	7/7	N/A	6 414344	0.2 C	Y	ASL
959-98-8	Endosulfan I	1 795762		1 795762		ug/kg	OFF-2-BM-052698	1/7	0 3719-2 1536	1 795762	810 N	N	BSL
33213-65-9	Endosulfan II	0 330894	J	3 030163		ug/kg	OFF-1-BM-052698	7/7	N/A	3 030163	810 N	N	BSL
58-89-9	Gamma-BHC (Lindane)	0 303133		0 722804		ug/kg	OFF-7-BM-052698	7/7	N/A	0.722804	2 4 C	N	BSL
1024-57-3	Heptachlor Epoxide	0 412802		0 477647		ug/kg	OFF-3-BM-052698	2/7	0.1857-1.0755	0 477647	0.35 C	Y	ASL
2385855	Mirex	0 328406		5 732104	J	ug/kg	OFF-5-BM-052698	5/7	0 2191-0 5223	5 732104	270 C	N	BSL
1336-36-3	Total PCB Congeners	238		683		ug/kg	OFF-5-BM-052698	7/7	N/A	683	1 58 C	Y	ASL
57-74-9	trans-Nonachlor	3.044991		4.310349		ug/kg	OFF-3-BM-052698	7/7	N/A	4.310349	9 C	Y	CHLRD
92524	1,1-Biphenyl	1 017094		3 436154		ug/kg	OFF-1-BM-052698	7/7	4 7836-4 7836	3 436154	6800 N	N	BSL
91576	1-Methylnaphthalene	6.946096		9.545828	J	ug/kg	OFF-5-BM-052698	3/7	4.3019-6 4594	9.545828	2700 N	N	BSL
	1-Methylphenanthrene	2 817827		5.306226	J	ug/kg	OFF-5-BM-052698	7/7	N/A	5 306226		Y	NTX
	2,3,5-Trimethylnaphthalene	1 203622		5.343438		ug/kg	OFF-5-BM-052698	6/7	1 3975-1.3975	5 343438		Y	NTX
	2,6-Dimethylnaphthalene	3 337642		7 071235		ug/kg	OFF-5-BM-052698	7/7	N/A	7 071235		Y	NTX
91-57-6	2-Methylnaphthalene	10 082161		17 228148	J	ug/kg	OFF-5-BM-052698	3/7	7 3218-9 879	17 228148	2700 N	N	BSL
83-32-9	Acenaphthene	2.497497		7 668564	J	ug/kg	OFF-5-BM-052698	7/7	N/A	7 668564	8100 N	N	BSL

TABLE 6-2.4 (c ntinued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN BLUE MUSSELS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
208-96-8	Acenaphthylene	4 074188		7.316881		ug/kg	OFF-5-BM-052698	7/7	N/A	7 316881	2700 N	N	BSL
120-12-7	Anthracene	6 471593	J	11 259983	J	ug/kg	OFF-7-BM-052698	7/7	N/A	11 259983	41000 N	N	BSL
56-55-3	Benz(a)anthracene	7 476022		18 296905		ug/kg	OFF-7-BM-052698	7/7	N/A	18 296905	4.3 C	Y	ASL
50-32-8	Benzo(a)pyrene	4 789828		9.961397		ug/kg	OFF-5-BM-052698	7/7	N/A	9 961397	0 43 C	Y	ASL
205-99-2	Benzo(b)fluoranthene	9 409983		23 387303		ug/kg	OFF-7-BM-052698	7/7	N/A	23 387303	4.3 C	Y	ASL
	Benzo(e)pyrene	15.293256		42 734624		ug/kg	OFF-7-BM-052698	7/7	N/A	42 734624		Y	NTX
191-24-2	Benzo(g,h,i)perylene	6.83739	J	16.406995	J	ug/kg	OFF-5-BM-052698	7/7	N/A	16.406995	2700 N	N	BSL
207-08-9	Benzo(k)fluoranthene	8 465027		23.226213		ug/kg	OFF-7-BM-052698	7/7	N/A	23.226213	43 C	Y	PAH
218-01-9	Chrysene	23 073022		43 655942		ug/kg	OFF-7-BM-052698	7/7	N/A	43 655942	430 C	Y	PAH
53-70-3	Dibenz(a,h)anthracene	1.020283	J	2 038155	J	ug/kg	OFF-7-BM-052698	6/7	1 6957-4 1188	2 038155	0 43 C	Y	ASL
206-44-0	Fluoranthene	47 199927		109.615791		ug/kg	OFF-7-BM-052698	7/7	N/A	109 615791	5400 N	N	BSL
86-73-7	Fluorene	3.139576		11.561423	J	ug/kg	OFF-5-BM-052698	7/7	N/A	11 561423	5400 N	N	BSL
118-74-1	Hexachlorobenzene	0 177184	J	0 592772		ug/kg	OFF-6-BM-052698	6/7	0 4234-0.4234	0 592772	2 C	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	3.850535	J	11.485193	J	ug/kg	OFF-5-BM-052698	7/7	N/A	11 485193	4.3 C	Y	ASL
91-20-3	Naphthalene	17 238415		29 011531	J	ug/kg	OFF-5-BM-052698	2/7	7 3103-11 9293	29 011531	2700 N	N	BSL
	Perylene	9 079713		18 464083		ug/kg	OFF-3-BM-052698	4/7	3 4547-4 7103	18 464083		Y	NTX
85-01-8	Phenanthrene	17.349838		32 021515	J	ug/kg	OFF-5-BM-052698	7/7	N/A	32.021515	2700 N	N	BSL
129-00-0	Pyrene	34 155925		95.775813		ug/kg	OFF-7-BM-052698	7/7	N/A	95 775813	4100 N	N	BSL

Notes:
(1) Minimum/maximum detected concentration
(2) N/A - Refer to supporting information for background discussion
Due to a limited size data set, background values were not used in decisions to selected COPCs and are presented for informational purposes only
(3) Screening toxicity values from EPA Region 3 risk based concentraton for fish consumption, April, 2000
(4) Rationale Codes Selection Reason
Compound belong to same class as other carcinogenic Polyaromatic Hydrocarbons (PAHs) found above screening levels
Compound belong to same class as other technical chlordane components (CHLORD) found above screening levels
Compound belong to same class as other DDT-family analogs (DDT) found above screening levels
Above Screening Levels (ASL)
Lead is kept as a COPC because of there are no established screening values applicable for fish consumption (No RBC)
Deletion Reason:
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

TABLE 6-2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN CLAMS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Fish
Exposure Medium Clams
Exposure Point Ingestion

CAS Number	Chemical	Minimum [(1)] Concentration	Minimum Qualifier	Maximum [(1)] Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening [(3)] Toxicity Value	COPC Flag	Rationale for [(4)] Contaminant Deletion or Selection
7429-90-5	Aluminum	25 4		1203 8	J	mg/kg	OFF-15-HC-051498	15/15	N/A	1203 8		N	NTX
7440-36-0	Antimony	0.013		0.022		mg/kg	S9-OS-8-CL	3/3	N/A	0 022	0.054 N	N	BSL
7440-38-2	Arsenic	4 3		33 2		mg/kg	S9-OS-9-CL	15/15	N/A	33 2	0 0021 C	Y	ASL
7440-39-3	Barium	1.43		2 11		mg/kg	S9-OS-9-CL	3/15	32-32	2 11	9 5 N	N	BSL
7440-41-7	Beryllium	0 072		0 129		mg/kg	S9-OS-11-CL	3/3	N/A	0.129	0 27 N	N	BSL
7440-42-8	Boron	22 2		31 8		mg/kg	S9-OS-11-CL	3/3	N/A	31 8	12 N	Y	ASL
7440-43-9	Cadmium	0 466		11.2		mg/kg	OFF-15-HC-051498	15/15	N/A	11 2	0 14 N	Y	ASL
7440-70-2	Calcium	6170		10700		mg/kg	S9-OS-9-CL	3/3	N/A	10700		N	NUT
7440-47-3	Chromium	3 1	J	74 4		mg/kg	S9-OS-9-CL	10/15	0 5-0.5	74 4	0 41 N	Y	ASL
7440-48-4	Cobalt	1 23		2.31		mg/kg	S9-OS-8-CL	3/3	N/A	2 31		N	NTX
7440-50-8	Copper	4.2	J	10		mg/kg	S9-OS-11-CL	5/15	5-5	10		N	NTX
7439-89-6	Iron	114		438.6		mg/kg	OFF-15-PM-051498	15/15	N/A	438.6		N	NTX
7439-92-1	Lead	1 57		9 9		mg/kg	OFF-15-HC-051498-FD	15/15	N/A	9 9	N	Y	No RBC
7439-95-4	Magnesium	6440		10000		mg/kg	S9-OS-8-CL	3/3	N/A	10000		N	NUT
7439-96-5	Manganese	10 5		92 8		mg/kg	S9-OS-9-CL	3/3	N/A	92.8	19 N	Y	ASL
7439-97-6	Mercury	0.061		4		mg/kg	OFF-16-HC-052198	15/15	N/A	4	0 014 N	Y	ASL
7440-02-0	Nickel	13 4		29 3		mg/kg	OFF-10-HC-051498-FD	15/15	N/A	29.3	2.7 N	Y	ASL
7440-09-7	Potassium	9720		10900		mg/kg	S9-OS-8-CL	3/3	N/A	10900		N	NUT
7782-49-2	Selenium	1 48		1.48		mg/kg	S9-OS-9-CL	1/3	1-1 1	1 48	0 68 N	Y	ASL
7440-22-4	Silver	0 683		0 763		mg/kg	S9-OS-9-CL	3/15	0 5-0 5	0 763	0.68 N	Y	ASL
7440-23-5	Sodium	46300		76300		mg/kg	S9-OS-8-CL	3/3	N/A	76300		N	NUT
7440-28-0	Thallium	0 001		0 004		mg/kg	S9-OS-11-CL	3/3	N/A	0 004	0 0095 N	N	BSL
7440-62-2	Vanadium	1 36		3 73		mg/kg	S9-OS-9-CL	3/3	N/A	3.73	0 95 N	Y	ASL
7440-66-6	Zinc	58 9		112		mg/kg	OFF-15-HC-051498	15/15	N/A	112	41 N	Y	ASL
72-55-9	2,4'-DDD	1 13688		17 283134		ug/kg	OFF-20-HC-051498	11/12	0 616-0 616	17 283134	13 C	Y	ASL
50-29-3	2,4'-DDT	0 133469	J	2 242863		ug/kg	OFF-19-PM-052198	11/12	1 532-1 532	2 242863	9.3 C	Y	DDT
72-54-8	4,4'-DDD	6 796105	J	6 796105	J	ug/kg	OFF-10-HC-051498	1/12	1 3927-3.3945	6 796105	13 C	Y	DDT
72-55-9	4,4'-DDE	1 894615	J	5.869822		ug/kg	OFF-11-HC-051498	11/12	2 1947-2.1947	5 869822	9 3 C	Y	DDT
5103-71-9	Alpha-Chlordane	0 908205		1 886543		ug/kg	OFF-21-HC-051498	12/12	1.8415-1 8415	1 886543	9 C	N	BSL
11097-69-1	Aroclor-1254	30 01		85 54		ug/kg	S9-OS-11-CL	3/3	N/A	85.54	1.58 C	Y	ASL
60-57-1	Dieldrin	1 765666		4 556161		ug/kg	OFF-15-HC-051498	12/12	0 1852-10.1852	4 556161	0 2 C	Y	ASL
33213-65-9	Endosulfan II	1.250247		6.809299		ug/kg	OFF-20-HC-051498	7/12	0 4314-0 9392	6 809299	810 N	N	BSL

TABLE 6-2.5 (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN CLAMS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
58-89-9	Gamma-BHC (Lindane)	1 20798		2 32353		ug/kg	OFF-10-HC-051498	4/12	0 1111-0 242	2.32353	2 4 C	N	BSL
76-44-8	Heptachlor	0.270997	J	0 270997	J	ug/kg	OFF-16-HC-052198	1/12	0 4078-5 0715	0 270997	0 7 C	N	BSL
1024-57-3	Heptachlor Epoxide	0 099925	J	0 193376		ug/kg	OFF-17-HC-051498	3/12	0 1654-2 0574	0.193376	0.35 C	N	BSL
2385855	Mirex	0 202756		3 6123	J	ug/kg	OFF-15-HC-051498	10/12	0.3924-2 4267	3.6123	270 C	N	BSL
1336-36-3	Total PCB Congeners	33.55		1080		ug/kg	OFF-10-HC-051498	15/15	N/A	1080	1 58 C	Y	ASL
57-74-9	trans-Nonachlor	0 500612	J	1 689338		ug/kg	OFF-19-PM-052198	12/12	2 7864-2 7864	1 689338	9 C	N	BSL
92524	1,1-Biphenyl	0 677348	J	18 39		ug/kg	S9-OS-9-CL	15/15	9.1509-9 1509	18 39	6800 N	N	BSL
91576	1-Methylnaphthalene	19 314667		19 314667		ug/kg	OFF-10-HC-051498	1/12	1 3358-4 096	19 314667	2700 N	N	BSL
	1-Methylphenanthrene	1 272931	J	4.656825		ug/kg	OFF-19-PM-052198	12/12	1 0792-11 0792	4 656825		Y	NTX
	2,3,5-Trimethylnaphthalene	1 033272		1.663607		ug/kg	OFF-20-HC-051498	8/12	1 0149-6.4936	1 663607		Y	NTX
	2,6-Dimethylnaphthalene	1.321681		2 866485		ug/kg	OFF-19-PM-052198	12/12	0.0755-10 0755	2 866485		Y	NTX
91-57-6	2-Methylnaphthalene	24 485875		24 485875		ug/kg	OFF-10-HC-051498	1/12	2 1799-5 2482	24 485875	2700 N	N	BSL
83-32-9	Acenaphthene	1 041739	J	4.500314		ug/kg	OFF-19-PM-052198	14/15	1.4204-10 456	4.500314	8100 N	N	BSL
208-96-8	Acenaphthylene	1.259176	J	3.69	J	ug/kg	S9-OS-11-CL	15/15	9 172-9.172	3 69	2700 N	N	BSL
120-12-7	Anthracene	1.57	J	11 149569	J	ug/kg	OFF-19-PM-052198	15/15	N/A	11.149569	41000 N	N	BSL
56-55-3	Benz(a)anthracene	2.228426		22 88		ug/kg	S9-OS-11-CL	15/15	N/A	22 88	4 3 C	Y	ASL
50-32-8	Benzo(a)pyrene	1.247985	J	14 72		ug/kg	S9-OS-11-CL	15/15	N/A	14.72	0 43 C	Y	ASL
205-99-2	Benzo(b)fluoranthene	2 782094		41.6		ug/kg	S9-OS-11-CL	15/15	N/A	41 6	4 3 C	Y	ASL
	Benzo(e)pyrene	4.852933		34 87		ug/kg	S9-OS-11-CL	15/15	N/A	34.87		Y	NTX
191-24-2	Benzo(g,h,i)perylene	1 774952	J	25 03		ug/kg	S9-OS-11-CL	14/15	1.4096-8 718	25 03	2700 N	N	BSL
207-08-9	Benzo(k)fluoranthene	2.05658		14 809127		ug/kg	OFF-19-PM-052198	15/15	N/A	14.809127	43 C	Y	PAH
218-01-9	Chrysene	4 42	J	27 301548		ug/kg	OFF-19-PM-052198	15/15	N/A	27 301548	430 C	Y	PAH
53-70-3	Dibenz(a,h)anthracene	0.796473	J	2 98	J	ug/kg	S9-OS-11-CL	8/15	0.6336-7 8793	2 98	0.43 C	Y	ASL
132-64-9	Dibenzofuran	4 92	J	6 37	J	ug/kg	S9-OS-9-CL	3/3	N/A	6.37	540 N	N	BSL
	Dibenzothiophene	1 44	J	2 63	J	ug/kg	S9-OS-11-CL	3/3	N/A	2 63		Y	NTX
206-44-0	Fluoranthene	19 88821		75 83		ug/kg	S9-OS-11-CL	15/15	N/A	75.83	5400 N	N	BSL
86-73-7	Fluorene	0.75	J	6 24		ug/kg	S9-OS-11-CL	15/15	7 5842-7.5842	6.24	5400 N	N	BSL
118-74-1	Hexachlorobenzene	0.336314		1 087834		ug/kg	OFF-10-HC-051498-FD	11/12	0 3595-0.3595	1 087834	2 C	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	0 944037	J	16.78		ug/kg	S9-OS-11-CL	12/15	1 4576-11 334	16 78	4.3 C	Y	ASL
91-20-3	Naphthalene	46.998516		106 57	B	ug/kg	S9-OS-9-CL	4/15	3.6872-10 0767	106.57	2700 N	N	BSL
	Perylene	1 86	J	6 44		ug/kg	S9-OS-11-CL	3/15	0.8444-5 5818	6 44		Y	NTX
85-01-8	Phenanthrene	5 978856		29 37		ug/kg	S9-OS-11-CL	15/15	5 5885-5 5885	29 37	2700 N	N	BSL
129-00-0	Pyrene	16.83721		66 46		ug/kg	S9-OS-11-CL	15/15	N/A	66.46	4100 N	N	BSL

TABLE 6-2.5 (continued)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN CLAMS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Notes:

(1) Minimum/maximum detected concentration

(2) N/A - Refer to supporting information for background discussion.
Due to a limited size data set, background values were not used in decisions to selected COPCs and are presented for informational purposes only

(3) Screening toxicity values from EPA Region 3 risk based concentration for fish consumption, April, 2000.

(4) Rationale Codes Selection Reason:
Compound belong to same class as other carcinogenic Polyaromatic Hydrocarbons (PAHs) found above screening levels
Compound belong to same class as other technical chlordane components (CHLORD) found above screening levels.
Compound belong to same class as other DDT-family analogs (DDT) found above screening levels
Above Screening Levels (ASL)
Lead is kept as a COPC because of there are no established screening values applicable for fish consumption (No RBC)

Deletion Reason
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

TABLE 6-2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN LOBSTER
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium Fish
Exposure Medium. Lobster
Exposure Point Ingestion

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
7429-90-5	Aluminum	321 5		397 3		mg/kg	OFF-15-LOB-060898	12/12	N/A	397 3		Y	NTX
7440-38-2	Arsenic	5.7		10 2		mg/kg	OFF-17-LOB-061298	12/12	N/A	10 2	0.0021 C	Y	ASL
7440-43-9	Cadmium	1 5		13 3		mg/kg	OFF-13-LOB-061098	11/12	0 5-0 5	13 3	0 14 N	Y	ASL
7440-47-3	Chromium	10.5		21 1		mg/kg	OFF-20-LOB-060898	12/12	N/A	21.1	0 41 N	Y	ASL
7440-50-8	Copper	101.3		194 2		mg/kg	OFF-17-LOB-061298	12/12	N/A	194 2		Y	NTX
7439-89-6	Iron	76 4		160 3		mg/kg	OFF-20-LOB-060898	12/12	N/A	160.3		Y	NTX
7439-92-1	Lead	11.3		19		mg/kg	OFF-15-LOB-060898	12/12	N/A	19	N	Y	No RBC
7439-97-6	Mercury	1 4		7.2		mg/kg	OFF-14-LOB-061298	12/12	N/A	7.2	0 014 N	Y	ASL
7440-02-0	Nickel	28 5		44 9		mg/kg	OFF-20-LOB-060898	12/12	N/A	44 9	2 7 N	Y	ASL
7440-22-4	Silver	2 3		5		mg/kg	OFF-20-LOB-060898	12/12	N/A	5	0 68 N	Y	ASL
7440-66-6	Zinc	231		297.5		mg/kg	OFF-16-LOB-061098	12/12	N/A	297.5	41 N	Y	ASL
72-55-9	2,4'-DDD	0 148288	J	0 6922		ug/kg	OFF-13-LOB-061098	4/11	0.3645-0.702	0 6922	13 C	Y	DDT
50-29-3	2,4'-DDT	0 157599	J	0 787354	J	ug/kg	OFF-13-LOB-061098	10/11	1 2384-1.2384	0 787354	9.3 C	Y	DDT
72-54-8	4,4'-DDD	0.304204	J	1.567613	J	ug/kg	OFF-18-LOB-060898	11/11	N/A	1 567613	13 C	Y	DDT
72-55-9	4,4'-DDE	4 154377		22 048708		ug/kg	OFF-13-LOB-061098	11/11	N/A	22.048708	9 3 C	Y	ASL
50-29-3	4,4'-DDT	0.064121	J	0 627459	J	ug/kg	OFF-16-LOB-061098	9/11	0 7174-0 882	0 627459	9 3 C	Y	DDT
5103-71-9	Alpha-Chlordane	0 163579	J	1.344033		ug/kg	OFF-13-LOB-061098	11/11	N/A	1.344033	9 C	N	BSL
60-57-1	Dieldrin	2 495594		6 273958		ug/kg	OFF-13-LOB-061098	11/11	N/A	6 273958	0 2 C	Y	ASL
33213-65-9	Endosulfan II	0.200814	J	0 843737		ug/kg	OFF-21-LOB-061598	11/11	N/A	0 843737	810 N	N	BSL
58-89-9	Gamma-BHC (Lindane)	0 596943		1 895638		ug/kg	OFF-18-LOB-060898	10/11	0 1398-0 1398	1.895638	2 4 C	N	BSL
1024-57-3	Heptachlor Epoxide	0 084338	J	0 084338	J	ug/kg	OFF-19-LOB-060898	1/11	0.1968-0 3791	0.084338	0 35 C	N	BSL
2385855	Mirex	0 223387	J	0 497562		ug/kg	OFF-19-LOB-060898	3/11	0 2322-0.4472	0.497562	270 C	N	BSL
1336-36-3	Total PCB Congeners	168		331		ug/kg	OFF-21-LOB-061598	11/11	N/A	331	1 58 C	Y	ASL
57-74-9	trans-Nonachlor	0.191382	J	0 690496		ug/kg	OFF-13-LOB-061098	10/11	0 3399-0.3399	0 690496	9 C	N	BSL
92524	1,1-Biphenyl	0.987034	J	0.987034	J	ug/kg	OFF-19-LOB-060898	1/11	0 8755-1.6863	0.987034	6800 N	N	BSL
91576	1-Methylnaphthalene	10.601609	J	11.725334		ug/kg	OFF-18-LOB-060898	2/11	3 752-7.2713	11.725334	2700 N	N	BSL
	1-Methylphenanthrene	0.861873	J	4.068748		ug/kg	OFF-16-LOB-061098	10/11	1 3514-1.3514	4 068748		Y	NTX
	2,3,5-Trimethylnaphthalene	0.853248		2.073974		ug/kg	OFF-18-LOB-060898	5/11	0 6213-1.1966	2.073974		Y	NTX
	2,6-Dimethylnaphthalene	1.503517	J	2.365673	J	ug/kg	OFF-18-LOB-060898	9/11	0 9996-1 2289	2.365673		Y	NTX
91-57-6	2-Methylnaphthalene	8.171734		16 784856		ug/kg	OFF-18-LOB-060898	5/11	4 5599-8.5871	16 784856	2700 N	N	BSL
83-32-9	Acenaphthene	1.167782		7.50818		ug/kg	OFF-16-LOB-060898	6/11	1 0373-1 9268	7.50818	8100 N	N	BSL
120-12-7	Anthracene	0.574154	J	4 44318	J	ug/kg	OFF-16-LOB-061098	9/11	0.6315-0.6902	4 44318	41000 N	N	BSL

TABLE 6-2.6 (continu d)
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN LOBSTER
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

CAS Number	Chemical	Minimum (1) Concentration	Minimum Qualifier	Maximum (1) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Screening (3) Toxicity Value	COPC Flag	Rationale for (4) Contaminant Deletion or Selection
56-55-3	Benz(a)anthracene	1 130349	J	101 610533		ug/kg	OFF-21-LOB-061598	11/11	N/A	101 610533	4.3 C	Y	ASL
50-32-8	Benzo(a)pyrene	1 559298	J	258.536201		ug/kg	OFF-21-LOB-061598	11/11	N/A	258 536201	0 43 C	Y	ASL
205-99-2	Benzo(b)fluoranthene	1 958069		315 446617		ug/kg	OFF-21-LOB-061598	11/11	N/A	315 446617	4 3 C	Y	ASL
	Benzo(e)pyrene	2 80322		108 100437		ug/kg	OFF-21-LOB-061598	11/11	N/A	108.100437		Y	NTX
191-24-2	Benzo(g,h,i)perylene	1 581273		41.835148		ug/kg	OFF-21-LOB-061598	11/11	N/A	41 835148	2700 N	N	BSL
207-08-9	Benzo(k)fluoranthene	1.571579		160 536235		ug/kg	OFF-21-LOB-061598	11/11	N/A	160 536235	43 C	Y	ASL
218-01-9	Chrysene	4 646832		225 036088		ug/kg	OFF-21-LOB-061598	11/11	N/A	225 036088	430 C	Y	PAH
53-70-3	Dibenz(a,h)anthracene	0 857179	J	12 081393		ug/kg	OFF-21-LOB-061598	5/11	0 7817-1 4519	12 081393	0 43 C	Y	ASL
206-44-0	Fluoranthene	9 672864		212 243442		ug/kg	OFF-21-LOB-061598	11/11	N/A	212 243442	5400 N	N	BSL
86-73-7	Fluorene	0.741837	J	2 634582		ug/kg	OFF-16-LOB-060898	9/11	0.9251-1.303	2.634582	5400 N	N	BSL
118-74-1	Hexachlorobenzene	0.257338		0.547835		ug/kg	OFF-18-LOB-060898	11/11	N/A	0 547835	2 C	N	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	1 942362	J	114.478557	J	ug/kg	OFF-21-LOB-061598	9/11	1 2648-1 3824	114 478557	4.3 C	Y	ASL
91-20-3	Naphthalene	13.676892		19.805924		ug/kg	OFF-16-LOB-060898	3/11	7 7532-14 5049	19.805924	2700 N	N	BSL
	Perylene	4.80882		10 356547		ug/kg	OFF-13-LOB-061098	2/11	2 2636-37 5068	10 356547		Y	NTX
85-01-8	Phenanthrene	4.835774		14.592396		ug/kg	OFF-16-LOB-061098	8/11	2.9407-3 0248	14.592396	2700 N	N	BSL
129-00-0	Pyrene	6 940448		159 98439		ug/kg	OFF-21-LOB-061598	11/11	N/A	159.98439	4100 N	N	BSL

Notes.
(1) Minimum/maximum detected concentration
(2) N/A - Refer to supporting information for background discussion
Background values derived from statistical analysis Follow Regional guidance and provide supporting information.
(3) Screening toxicity values from EPA Region 3 risk based concentration for fish consumption, April, 2000
(4) Rationale Codes Selection Reason. Compound belong to same class as other carcinogenic Polyaromatic Hydrocarbons (PAHs) found above screening levels
Compound belong to same class as other DDT-family analogs (DDT) found above screen
Above Screening Levels (ASL)
Lead is kept as a COPC because of there are no established screening values applicable for fish consumption (No RBC)
Deletion Reason. No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

TABLE 6-3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe
Medium Surface Soil
Exposure Medium Surface Soil
Exposure Point: Ingestion, Dermal Contact, and Inhalation of dust

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Total 2,3,7,8-TCDD Equiv	ug/kg	0.00752	0.012	0 016388		ug/kg	0.012	95%UCL-N	Wno>=Wt&>Wlg	0 012	95%UCL-N	Wno>=Wt&>Wlg
Aluminum	mg/kg	8820	9340	12200		mg/kg	9340	95%UCL-N	Wt >Wno> Wlg	9340	95%UCL-N	Wt >Wno> Wlg
Antimony	mg/kg	2 07	3.35	9.1	J	mg/kg	3 35	95%UCL-H	Wt >Wlg>=Wno	3 35	95%UCL-H	Wt >Wlg>=Wno
Arsenic	mg/kg	5 96	6 36	10 4		mg/kg	6 36	95%UCL-N	Wt >Wno> Wlg	6 36	95%UCL-N	Wt >Wno> Wlg
Barium	mg/kg	26 7	31.8	282		mg/kg	31 8	95%UCL-H	Wt >Wlg>=Wno	31 8	95%UCL-H	Wt >Wlg>=Wno
Beryllium	mg/kg	0.328	0.348	0 6		mg/kg	0.348	95%UCL-N	Wt >Wno> Wlg	0.348	95%UCL-N	Wt >Wno> Wlg
Cadmium	mg/kg	0.24	0.278	0 94		mg/kg	0 278	95%UCL-N	Wt >Wno> Wlg	0 278	95%UCL-N	Wt >Wno> Wlg
Calcium	mg/kg	1470	1670	21000		mg/kg	1670	95%UCL-H	Wt >Wlg>=Wno	1670	95%UCL-H	Wt >Wlg>=Wno
Chromium	mg/kg	12 6	14 3	37.9		mg/kg	14 3	95%UCL-H	Wt >Wlg>=Wno	14 3	95%UCL-H	Wt >Wlg>=Wno
Cobalt	mg/kg	6.79	7.43	20		mg/kg	7 43	95%UCL-N	Wt >Wno> Wlg	7 43	95%UCL-N	Wt >Wno> Wlg
Copper	mg/kg	20.6	23.8	220		mg/kg	23 8	95%UCL-H	Wt >Wlg>=Wno	23.8	95%UCL-H	Wt >Wlg>=Wno
Iron	mg/kg	17800	19800	107000		mg/kg	19800	95%UCL-H	Wt >Wlg>=Wno	19800	95%UCL-H	Wt >Wlg>=Wno
Lead	mg/kg	80 1	64 8	2970		mg/kg	49 7	Mean-T	IEUBK Uses LgAV	49 7	Mean-T	IEUBK Uses LgAV
Magnesium	mg/kg	2190	2410	7340		mg/kg	2410	95%UCL-H	Wt >Wlg>=Wno	2410	95%UCL-H	Wt >Wlg>=Wno
Manganese	mg/kg	267	290	750		mg/kg	290	95%UCL-H	Wt >Wlg>=Wno	290	95%UCL-H	Wt >Wlg>=Wno
Mercury	mg/kg	0 066	0 0711	0.61		mg/kg	0 0711	95%UCL-H	Wt >Wlg>=Wno	0 0711	95%UCL-H	Wt >Wlg>=Wno
Nickel	mg/kg	15 1	17 4	221		mg/kg	17 4	95%UCL-H	Wt >Wlg>=Wno	17 4	95%UCL-H	Wt >Wlg>=Wno
Potassium	mg/kg	365	409	1270		mg/kg	409	95%UCL-H	Wt >Wlg>=Wno	409	95%UCL-H	Wt >Wlg>=Wno
Selenium	mg/kg	0 309	0 328	0.66	J	mg/kg	0 328	95%UCL-H	Wt >Wlg>=Wno	0 328	95%UCL-H	Wt >Wlg>=Wno
Silver	mg/kg	2.22	2 81	26 5	J	mg/kg	2 81	95%UCL-H	Wt >Wlg>=Wno	2.81	95%UCL-H	Wt >Wlg>=Wno
Sodium	mg/kg	129	159	907		mg/kg	159	95%UCL-H	Wt >Wlg>=Wno	159	95%UCL-H	Wt >Wlg>=Wno
Vanadium	mg/kg	16 7	18	41 2		mg/kg	18	95%UCL-N	Wt >Wno> Wlg	18	95%UCL-N	Wt >Wno> Wlg
Zinc	mg/kg	98 4	95 2	1910	J	mg/kg	95 2	95%UCL-H	Wt >Wlg>=Wno	95 2	95%UCL-H	Wt >Wlg>=Wno
4,4'-DDD	ug/kg	4 62	5.79	17	J	ug/kg	5.79	95%UCL-H	Wlg>=Wt& Wno	5 79	95%UCL-H	Wlg>=Wt& Wno

TABLE 6-3.1 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 4

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
4,4'-DDE	ug/kg	9.15	13 4	42		ug/kg	13 4	95%UCL-H	Wlg>=Wt& Wno	13 4	95%UCL-H	Wlg>=Wt& Wno
4,4'-DDT	ug/kg	17	23	74		ug/kg	23	95%UCL-H	Wlg>=Wt& Wno	23	95%UCL-H	Wlg>=Wt& Wno
Aldrin	ug/kg	4 23	3 28	1.5	J	ug/kg	1 5	Max	Max<95%UCL-H	1.5	Max	Mean-T>Max
Alpha-BHC	ug/kg	1 35	1 56	1 7	J	ug/kg	1.56	95%UCL-N	Wt >Wno> Wlg	1 56	95%UCL-N	Wt >Wno> Wlg
Alpha-Chlordane	ug/kg	6 01	8 41	14		ug/kg	8 41	95%UCL-H	Wt >Wlg>=Wno	8 41	95%UCL-H	Wt >Wlg>=Wno
Aroclor-1254	ug/kg	38	37 1	530		ug/kg	37.1	95%UCL-H	Wt >Wlg>=Wno	37 1	95%UCL-H	Wt >Wlg>=Wno
Beta-BHC	ug/kg	1 31	1 52	0 99	J	ug/kg	0.99	Max	Max<95%UCL-H	0.99	Max	Mean-T>Max
Dieldrin	ug/kg	3 77	4 99	11	J	ug/kg	4 99	95%UCL-H	Wlg>=Wt& Wno	4 99	95%UCL-H	Wlg>=Wt& Wno
Endosulfan I	ug/kg	1 63	1 88	9 4	J	ug/kg	1 88	95%UCL-H	Wt >Wlg>=Wno	1 88	95%UCL-H	Wt >Wlg>=Wno
Endosulfan II	ug/kg	3 95	7 05	25	NJ	ug/kg	7.05	95%UCL-H	Wt >Wlg>=Wno	7 05	95%UCL-H	Wt >Wlg>=Wno
Endosulfan Sulfate	ug/kg	3.94	5 14	33	J	ug/kg	5 14	95%UCL-H	Wt >Wlg>=Wno	5 14	95%UCL-H	Wt >Wlg>=Wno
Endrin	ug/kg	8 14	11 2	74	J	ug/kg	11 2	95%UCL-H	Wlg>=Wt& Wno	11 2	95%UCL-H	Wlg>=Wt& Wno
Endrin Aldehyde	ug/kg	5 86	7 95	25	NJ	ug/kg	7 95	95%UCL-H	Wlg>=Wt& Wno	7 95	95%UCL-H	Wlg>=Wt& Wno
Endrin Ketone	ug/kg	2 67	2 97	2 9	J	ug/kg	2 9	Max	Max<95%UCL-H	2.67	Mean-T	Mean-T<=Max
Gamma-BHC (Lindane)	ug/kg	1 4	1 66	2 4	J	ug/kg	1 66	95%UCL-N	Wt >Wno> Wlg	1 66	95%UCL-N	Wt >Wno> Wlg
Gamma-Chlordane	ug/kg	5 58	9 4	7 8		ug/kg	7.8	Max	Max<95%UCL-H	5 58	Mean-T	Mean-T<=Max
Heptachlor	ug/kg	1 47	1 69	0 74	J	ug/kg	0 74	Max	Max<95%UCL-H	0 74	Max	Mean-T>Max
Heptachlor Epoxide	ug/kg	2 06	3 08	8 1	J	ug/kg	3.08	95%UCL-H	Wlg>=Wt& Wno	3.08	95%UCL-H	Wlg>=Wt& Wno
Methoxychlor	ug/kg	12 6	16 9	10	J	ug/kg	10	Max	Max<95%UCL-H	10	Max	Mean-T>Max
2-Methylnaphthalene	ug/kg	318	390	660		ug/kg	390	95%UCL-H	Wt >Wlg>=Wno	390	95%UCL-H	Wt >Wlg>=Wno
4-Chloro-3-methylphenol	ug/kg	324	380	140	J	ug/kg	140	Max	Max<95%UCL-H	140	Max	Mean-T>Max
Acenaphthene	ug/kg	293	356	940		ug/kg	356	95%UCL-H	Wt >Wlg>=Wno	356	95%UCL-H	Wt >Wlg>=Wno
Acenaphthylene	ug/kg	310	380	140	J	ug/kg	140	Max	Max<95%UCL-H	140	Max	Mean-T>Max
Anthracene	ug/kg	370	444	3800		ug/kg	444	95%UCL-H	Wt >Wlg>=Wno	444	95%UCL-H	Wt >Wlg>=Wno
Benz(a)anthracene	ug/kg	488	559	9100		ug/kg	559	95%UCL-H	Wt >Wlg>=Wno	559	95%UCL-H	Wt >Wlg>=Wno
Benzo(a)pyrene	ug/kg	466	553	7100		ug/kg	553	95%UCL-H	Wt >Wlg>=Wno	553	95%UCL-H	Wt >Wlg>=Wno
Benzo(b)fluoranthene	ug/kg	538	639	9700		ug/kg	639	95%UCL-H	Wt >Wlg>=Wno	639	95%UCL-H	Wt >Wlg>=Wno

TABLE 6-3.1 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Benzo(g,h,i)perylene	ug/kg	313	378	4300		ug/kg	378	95%UCL-H	Wt >Wlg>=Wno	378	95%UCL-H	Wt >Wlg>=Wno
Benzo(k)fluoranthene	ug/kg	309	337	3500	J	ug/kg	337	95%UCL-H	Wt >Wlg>=Wno	337	95%UCL-H	Wt >Wlg>=Wno
Bis(2-ethylhexyl)phthalate	ug/kg	340	421	3200	J	ug/kg	421	95%UCL-H	Wt >Wlg>=Wno	421	95%UCL-H	Wt >Wlg>=Wno
Carbazole	ug/kg	297	318	930	J	ug/kg	318	95%UCL-H	Wt >Wlg>=Wno	318	95%UCL-H	Wt >Wlg>=Wno
Chrysene	ug/kg	454	533	8100		ug/kg	533	95%UCL-H	Wt >Wlg>=Wno	533	95%UCL-H	Wt >Wlg>=Wno
Di-n-butylphthalate	ug/kg	289	358	170	J	ug/kg	170	Max	Max<95%UCL-H	170	Max	Mean-T>Max
Di-n-octylphthalate	ug/kg	317	371	54	J	ug/kg	54	Max	Max<95%UCL-H	54	Max	Mean-T>Max
Dibenz(a,h)anthracene	ug/kg	300	361	610		ug/kg	361	95%UCL-H	Wt >Wlg>=Wno	361	95%UCL-H	Wt >Wlg>=Wno
Dibenzofuran	ug/kg	287	345	650		ug/kg	345	95%UCL-H	Wt >Wlg>=Wno	345	95%UCL-H	Wt >Wlg>=Wno
Fluoranthene	ug/kg	792	908	15000		ug/kg	908	95%UCL-H	Wt >Wlg>=Wno	908	95%UCL-H	Wt >Wlg>=Wno
Fluorene	ug/kg	296	358	1200		ug/kg	358	95%UCL-H	Wt >Wlg>=Wno	358	95%UCL-H	Wt >Wlg>=Wno
Hexachlorobenzene	ug/kg	318	374	210	J	ug/kg	210	Max	Max<95%UCL-H	210	Max	Mean-T>Max
Indeno(1,2,3-cd)pyrene	ug/kg	306	368	4100		ug/kg	368	95%UCL-H	Wt >Wlg>=Wno	368	95%UCL-H	Wt >Wlg>=Wno
N-Nitrosodiphenylamine (1)	ug/kg	319	371	150	J	ug/kg	150	Max	Max<95%UCL-H	150	Max	Mean-T>Max
Naphthalene	ug/kg	321	391	740		ug/kg	391	95%UCL-H	Wt >Wlg>=Wno	391	95%UCL-H	Wt >Wlg>=Wno
Pentachlorophenol	ug/kg	854	983	350	J	ug/kg	350	Max	Max<95%UCL-H	350	Max	Mean-T>Max
Phenanthrene	ug/kg	652	759	9700		ug/kg	759	95%UCL-H	Wt >Wlg>=Wno	759	95%UCL-H	Wt >Wlg>=Wno
Phenol	ug/kg	318	372	60	J	ug/kg	60	Max	Max<95%UCL-H	60	Max	Mean-T>Max
Pyrene	ug/kg	741	940	12000		ug/kg	940	95%UCL-H	Wt >Wlg>=Wno	940	95%UCL-H	Wt >Wlg>=Wno
1,1,1-Trichloroethane	ug/kg	3 9	4.36	2	J	ug/kg	2	Max	Max<95%UCL-H	2	Max	Mean-T>Max
1,2-Dichloroethene (Total)	ug/kg	4.23	4.65	17		ug/kg	4 65	95%UCL-H	Wt >Wlg>=Wno	4.65	95%UCL-H	Wt >Wlg>=Wno
2-Butanone	ug/kg	6 25	6 74	13		ug/kg	6 74	95%UCL-N	Wt >Wno> Wlg	6 74	95%UCL-N	Wt >Wno> Wlg
2-Hexanone	ug/kg	5 98	6 19	32		ug/kg	6.19	95%UCL-H	Wt >Wlg>=Wno	6.19	95%UCL-H	Wt >Wlg>=Wno
Acetone	ug/kg	56.9	90 5	320	J	ug/kg	90 5	95%UCL-H	Wt >Wlg>=Wno	90 5	95%UCL-H	Wt >Wlg>=Wno
Bromomethane	ug/kg	4 29	4.66	1	J	ug/kg	1	Max	Max<95%UCL-N	1	Max	Avg > Max
Carbon Disulfide	ug/kg	4.06	4.46	2	J	ug/kg	2	Max	Max<95%UCL-H	2	Max	Mean-T>Max
Chloromethane	ug/kg	4.25	4 63	1	J	ug/kg	1	Max	Max<95%UCL-N	1	Max	Avg > Max

TABLE 6-3.1 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
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Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Methylene Chloride	ug/kg	3 64	4 13	4	J	ug/kg	4	Max	Max<95%UCL-H	3.64	Mean-T	Mean-T<=Max
Tetrachloroethene	ug/kg	4.13	4 59	16		ug/kg	4 59	95%UCL-H	Wt >Wlg>=Wno	4 59	95%UCL-H	Wt >Wlg>=Wno
Toluene	ug/kg	3.71	4.14	4	J	ug/kg	4	Max	Max<95%UCL-H	3 71	Mean-T	Mean-T<=Max
Trichloroethene	ug/kg	3.88	4 38	1	J	ug/kg	1	Max	Max<95%UCL-H	1	Max	Mean-T>Max
Vinyl Chloride	ug/kg	4.07	4 46	3	J	ug/kg	3	Max	Max<95%UCL-H	3	Max	Mean-T>Max
Xylene (Total)	ug/kg	3 57	4	3	J	ug/kg	3	Max	Max<95%UCL-H	3	Max	Mean-T>Max

Statistics. Maximum Detected Value (Max), 95% UCL of Normal Data (95% UCL-N), 95% UCL of Log-transformed Data (95% UCL-H), Mean of Log-transformed Data (Mean-T), Mean of Normal Data (Mean-N)

TABLE 6-3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe.
Medium· Subsurface Soil
Exposure Medium· Subsurface Soil
Exposure Point Ingestion, Dermal Contact, and Inhalation of dust

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Aluminum	mg/kg	8700	9610	20700		mg/kg	9610	95%UCL-H	Wlg>=Wt& Wno	9610	95%UCL-H	Wlg>=Wt& Wno
Antimony	mg/kg	4.59	9.08	39.2	J	mg/kg	9.08	95%UCL-H	Wt >Wlg>=Wno	9 08	95%UCL-H	Wt >Wlg>=Wno
Arsenic	mg/kg	8 74	10.1	74 4	J	mg/kg	10 1	95%UCL-H	Wlg>=Wt& Wno	10 1	95%UCL-H	Wlg>=Wt& Wno
Barium	mg/kg	40 5	51.2	220		mg/kg	51.2	95%UCL-H	Wt >Wlg>=Wno	51 2	95%UCL-H	Wt >Wlg>=Wno
Beryllium	mg/kg	0 24	0.268	0.48	B1	mg/kg	0.268	95%UCL-N	Wno>=Wt&>Wlg	0.268	95%UCL-N	Wno>=Wt&>Wlg
Cadmium	mg/kg	0 917	3 27	8.1		mg/kg	3.27	95%UCL-H	Wt >Wlg>=Wno	3 27	95%UCL-H	Wt >Wlg>=Wno
Calcium	mg/kg	6280	7700	91300		mg/kg	7700	95%UCL-H	Wt >Wlg>=Wno	7700	95%UCL-H	Wt >Wlg>=Wno
Chromium	mg/kg	14 1	15 6	61 9		mg/kg	15 6	95%UCL-H	Wt >Wlg>=Wno	15 6	95%UCL-H	Wt >Wlg>=Wno
Cobalt	mg/kg	10 4	11.3	20 5	J*	mg/kg	11.3	95%UCL-N	Wno>=Wt&>Wlg	11 3	95%UCL-N	Wno>=Wt&>Wlg
Copper	mg/kg	112	113	2310		mg/kg	113	95%UCL-H	Wt >Wlg>=Wno	113	95%UCL-H	Wt >Wlg>=Wno
Iron	mg/kg	34100	38200	204000		mg/kg	38200	95%UCL-H	Wt >Wlg>=Wno	38200	95%UCL-H	Wt >Wlg>=Wno
Lead	mg/kg	564	1390	7820	J	mg/kg	507	Mean-T	IEUBK Uses LgAV	507	Mean-T	IEUBK Uses LgAV
Magnesium	mg/kg	3220	3510	7770		mg/kg	3510	95%UCL-N	Wno>=Wt&>Wlg	3510	95%UCL-N	Wno>=Wt&>Wlg
Manganese	mg/kg	398	477	1110	J	mg/kg	477	95%UCL-H	Wlg>=Wt& Wno	477	95%UCL-H	Wlg>=Wt& Wno
Mercury	mg/kg	0 186	0.34	2.2	J	mg/kg	0 34	95%UCL-H	Wlg>=Wt& Wno	0 34	95%UCL-H	Wlg>=Wt& Wno
Nickel	mg/kg	20	22.8	64 1		mg/kg	22 8	95%UCL-H	Wlg>=Wt& Wno	22 8	95%UCL-H	Wlg>=Wt& Wno
Potassium	mg/kg	425	493	1030	B	mg/kg	493	95%UCL-H	Wlg>=Wt& Wno	493	95%UCL-H	Wlg>=Wt& Wno
Selenium	mg/kg	0 468	0 56	1.7	B1	mg/kg	0.56	95%UCL-H	Wt >Wlg>=Wno	0.56	95%UCL-H	Wt >Wlg>=Wno
Sodium	mg/kg	508	1030	3820		mg/kg	1030	95%UCL-H	Wt >Wlg>=Wno	1030	95%UCL-H	Wt >Wlg>=Wno
Vanadium	mg/kg	16.7	19 6	57		mg/kg	19.6	95%UCL-H	Wt >Wlg>=Wno	19 6	95%UCL-H	Wt >Wlg>=Wno
Zinc	mg/kg	468	609	4240		mg/kg	609	95%UCL-H	Wt >Wlg>=Wno	609	95%UCL-H	Wt >Wlg>=Wno
4,4'-DDD	ug/kg	6.8	7.02	89	J	ug/kg	7 02	95%UCL-H	Wt >Wlg>=Wno	7 02	95%UCL-H	Wt >Wlg>=Wno
4,4'-DDE	ug/kg	5.13	6 01	67	J	ug/kg	6.01	95%UCL-H	Wt >Wlg>=Wno	6 01	95%UCL-H	Wt >Wlg>=Wno
4,4'-DDT	ug/kg	19.6	20.8	370		ug/kg	20.8	95%UCL-H	Wt >Wlg>=Wno	20 8	95%UCL-H	Wt >Wlg>=Wno

TABLE 6-3.2 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
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Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Alpha-BHC	ug/kg	1 22	1 68	2 5	J	ug/kg	1.68	95%UCL-H	Wt >Wlg>=Wno	1 68	95%UCL-H	Wt >Wlg>=Wno
Alpha-Chlordane	ug/kg	1.52	1 7	10	NJ	ug/kg	1 7	95%UCL-H	Wt >Wlg>=Wno	1 7	95%UCL-H	Wt >Wlg>=Wno
Aroclor-1254	ug/kg	36.3	41 7	190	J	ug/kg	41 7	95%UCL-H	Wt >Wlg>=Wno	41 7	95%UCL-H	Wt >Wlg>=Wno
Aroclor-1260	ug/kg	29 5	32 4	39	J	ug/kg	32 4	95%UCL-H	Wt >Wlg>=Wno	32 4	95%UCL-H	Wt >Wlg>=Wno
Delta-BHC	ug/kg	1 53	1 68	2 4	J	ug/kg	1 68	95%UCL-H	Wt >Wlg>=Wno	1 68	95%UCL-H	Wt >Wlg>=Wno
Dieldrin	ug/kg	5.75	6 97	44	J	ug/kg	6.97	95%UCL-H	Wt >Wlg>=Wno	6 97	95%UCL-H	Wt >Wlg>=Wno
Endosulfan I	ug/kg	1.87	2 22	5 4	J	ug/kg	2.22	95%UCL-H	Wt >Wlg>=Wno	2.22	95%UCL-H	Wt >Wlg>=Wno
Endosulfan II	ug/kg	3 8	4 95	13	J	ug/kg	4 95	95%UCL-H	Wt >Wlg>=Wno	4 95	95%UCL-H	Wt >Wlg>=Wno
Endosulfan Sulfate	ug/kg	3 32	3 74	17	J	ug/kg	3 74	95%UCL-H	Wt >Wlg>=Wno	3 74	95%UCL-H	Wt >Wlg>=Wno
Endrin	ug/kg	8 93	9 94	120	J	ug/kg	9 94	95%UCL-H	Wt >Wlg>=Wno	9.94	95%UCL-H	Wt >Wlg>=Wno
Endrin Aldehyde	ug/kg	13 8	17.5	16	J	ug/kg	16	Max	Max<95%UCL-H	13 8	Mean-T	Mean-T<=Max
Gamma-BHC (Lindane)	ug/kg	1 43	1 72	3.1	NJ	ug/kg	1.72	95%UCL-H	Wt >Wlg>=Wno	1 72	95%UCL-H	Wt >Wlg>=Wno
Gamma-Chlordane	ug/kg	1.53	2	2.5	J	ug/kg	2	95%UCL-H	Wt >Wlg>=Wno	2	95%UCL-H	Wt >Wlg>=Wno
Heptachlor	ug/kg	1 5	1 63	1 4	J	ug/kg	1.4	Max	Max<95%UCL-H	1 5	Mean-T	Mean-T<=Max
Heptachlor Epoxide	ug/kg	3 03	3 21	43		ug/kg	3 21	95%UCL-H	Wt >Wlg>=Wno	3 21	95%UCL-H	Wt >Wlg>=Wno
Methoxychlor	ug/kg	14 9	16 5	4	NJ	ug/kg	4	Max	Max<95%UCL-H	4	Max	Mean-T>Max
2-Methylnaphthalene	ug/kg	1050	1530	11000		ug/kg	1530	95%UCL-H	Wt >Wlg>=Wno	1530	95%UCL-H	Wt >Wlg>=Wno
4,6-Dinitro-2-methylphenol	ug/kg	1280	1420	320	J	ug/kg	320	Max	Max<95%UCL-H	320	Max	Mean-T>Max
Acenaphthene	ug/kg	682	839	4900		ug/kg	839	95%UCL-H	Wt >Wlg>=Wno	839	95%UCL-H	Wt >Wlg>=Wno
Acenaphthylene	ug/kg	493	609	640		ug/kg	609	95%UCL-H	Wt >Wlg>=Wno	609	95%UCL-H	Wt >Wlg>=Wno
Anthracene	ug/kg	559	752	4800		ug/kg	752	95%UCL-H	Wlg>=Wt& Wno	752	95%UCL-H	Wlg>=Wt& Wno
Benz(a)anthracene	ug/kg	787	1230	3400		ug/kg	1230	95%UCL-H	Wlg>=Wt& Wno	1230	95%UCL-H	Wlg>=Wt& Wno
Benzo(a)pyrene	ug/kg	819	1210	4000		ug/kg	1210	95%UCL-H	Wlg>=Wt& Wno	1210	95%UCL-H	Wlg>=Wt& Wno
Benzo(b)fluoranthene	ug/kg	736	1080	2800		ug/kg	1080	95%UCL-H	Wlg>=Wt& Wno	1080	95%UCL-H	Wlg>=Wt& Wno
Benzo(g,h,i)perylene	ug/kg	564	735	1900	J	ug/kg	735	95%UCL-H	Wt >Wlg>=Wno	735	95%UCL-H	Wt >Wlg>=Wno
Benzo(k)fluoranthene	ug/kg	561	704	2500	J	ug/kg	704	95%UCL-H	Wt >Wlg>=Wno	704	95%UCL-H	Wt >Wlg>=Wno

TABLE 6-3.2 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Benzoic Acid	ug/kg	499	0	48	J	ug/kg	48	Max	n<5,use Max	499	Mean-T	Mean-T<=Max
Bis(2-ethylhexyl)phthalate	ug/kg	416	432	110	J	ug/kg	110	Max	Max<95%UCL-H	110	Max	Mean-T>Max
Butylbenzylphthalate	ug/kg	488	522	120	J	ug/kg	120	Max	Max<95%UCL-H	120	Max	Mean-T>Max
Carbazole	ug/kg	498	557	220	J	ug/kg	220	Max	Max<95%UCL-H	220	Max	Mean-T>Max
Chrysene	ug/kg	785	1260	3200	J	ug/kg	1260	95%UCL-H	Wlg>=Wt& Wno	1260	95%UCL-H	Wlg>=Wt& Wno
Di-n-butylphthalate	ug/kg	462	560	1400	*	ug/kg	560	95%UCL-H	Wt >Wlg>=Wno	560	95%UCL-H	Wt >Wlg>=Wno
Dibenz(a,h)anthracene	ug/kg	456	513	820	J	ug/kg	513	95%UCL-H	Wt >Wlg>=Wno	513	95%UCL-H	Wt >Wlg>=Wno
Dibenzofuran	ug/kg	693	924	4000		ug/kg	924	95%UCL-H	Wt >Wlg>=Wno	924	95%UCL-H	Wt >Wlg>=Wno
Fluoranthene	ug/kg	1540	2660	16000		ug/kg	2660	95%UCL-H	Wlg>=Wt& Wno	2660	95%UCL-H	Wlg>=Wt& Wno
Fluorene	ug/kg	667	896	3400	J	ug/kg	896	95%UCL-H	Wt >Wlg>=Wno	896	95%UCL-H	Wt >Wlg>=Wno
Hexachlorobenzene	ug/kg	507	553	370	J	ug/kg	370	Max	Max<95%UCL-H	370	Max	Mean-T>Max
Indeno(1,2,3-cd)pyrene	ug/kg	615	860	2300	J	ug/kg	860	95%UCL-H	Wt >Wlg>=Wno	860	95%UCL-H	Wt >Wlg>=Wno
Naphthalene	ug/kg	707	975	4000		ug/kg	975	95%UCL-H	Wt >Wlg>=Wno	975	95%UCL-H	Wt >Wlg>=Wno
Phenanthrene	ug/kg	2090	4800	14000		ug/kg	4800	95%UCL-H	Wlg>=Wt& Wno	4800	95%UCL-H	Wlg>=Wt& Wno
Phenol	ug/kg	591	781	490		ug/kg	490	Max	Max<95%UCL-H	591	Mean-T	Mean-T<=Max
Pyrene	ug/kg	1250	2140	5300		ug/kg	2140	95%UCL-H	Wlg>=Wt& Wno	2140	95%UCL-H	Wlg>=Wt& Wno
2-Butanone	ug/kg	104	156	1100	J	ug/kg	156	95%UCL-H	Wt >Wlg>=Wno	156	95%UCL-H	Wt >Wlg>=Wno
Carbon Disulfide	ug/kg	70 1	74 8	11		ug/kg	11	Max	Max<95%UCL-H	11	Max	Mean-T>Max
Chloroethane	ug/kg	75 2	98.6	1	J	ug/kg	1	Max	Max<95%UCL-H	1	Max	Mean-T>Max
Ethylbenzene	ug/kg	93 3	149	630	J	ug/kg	149	95%UCL-H	Wt >Wlg>=Wno	149	95%UCL-H	Wt >Wlg>=Wno
Methylene Chloride	ug/kg	184	281	1800	J	ug/kg	281	95%UCL-H	Wt >Wlg>=Wno	281	95%UCL-H	Wt >Wlg>=Wno
Toluene	ug/kg	69.1	97.9	67		ug/kg	67	Max	Max<95%UCL-H	69 1	Mean-T	Mean-T<=Max
Xylene (Total)	ug/kg	104	151	1200		ug/kg	151	95%UCL-H	Wt >Wlg>=Wno	151	95%UCL-H	Wt >Wlg>=Wno

Statistics Maximum Detected Value (Max), 95% UCL of Normal Data (95% UCL-N), 95% UCL of Log-transformed Data (95% UCL-H), Mean of Log-transformed Data (Mean-T);
Mean of Normal Data (Mean-N)

TABLE 6-3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe
Medium. Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion, Dermal Contact, and Inhalation of dust

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Aluminum	mg/kg	7960	9380	10300		mg/kg	9380	95%UCL-H	Wt >Wlg>=Wno	9380	95%UCL-H	Wt >Wlg>=Wno
Antimony	mg/kg	0 496	0 779	0 69	J	mg/kg	0.69	Max	Max<95%UCL-H	0 496	Mean-T	Mean-T<=Max
Arsenic	mg/kg	5 14	6 53	7.1		mg/kg	6 53	95%UCL-H	Wlg>=Wt& Wno	6.53	95%UCL-H	Wlg>=Wt& Wno
Barium	mg/kg	12 3	16 9	15 9		mg/kg	15.9	Max	Max<95%UCL-N	12 3	Mean-N	Avg <= Max
Beryllium	mg/kg	0 202	0 542	0 48		mg/kg	0 48	Max	Max<95%UCL-H	0 202	Mean-T	Mean-T<=Max
Calcium	mg/kg	14700	1050000	33500	J	mg/kg	33500	Max	Max<95%UCL-H	14700	Mean-T	Mean-T<=Max
Chromium	mg/kg	13	15	15.8		mg/kg	15	95%UCL-H	Wlg>=Wt& Wno	15	95%UCL-H	Wlg>=Wt& Wno
Cobalt	mg/kg	7 78	10 6	11.9		mg/kg	10 6	95%UCL-H	Wlg>=Wt& Wno	10.6	95%UCL-H	Wlg>=Wt& Wno
Copper	mg/kg	31 3	67	61 4		mg/kg	61 4	Max	Max<95%UCL-H	31.3	Mean-T	Mean-T<=Max
Iron	mg/kg	25900	38000	41500		mg/kg	38000	95%UCL-H	Wlg>=Wt& Wno	38000	95%UCL-H	Wlg>=Wt& Wno
Lead	mg/kg	72 3	187	168		mg/kg	70 2	Mean-T	IEUBK Uses LgAV	70.2	Mean-T	IEUBK Uses LgAV
Magnesium	mg/kg	5580	8210	9100		mg/kg	8210	95%UCL-H	Wlg>=Wt& Wno	8210	95%UCL-H	Wlg>=Wt& Wno
Manganese	mg/kg	541	1480	1240		mg/kg	1240	Max	Max<95%UCL-H	541	Mean-T	Mean-T<=Max
Nickel	mg/kg	24 2	50.1	50 8		mg/kg	50 1	95%UCL-H	Wlg>=Wt& Wno	50 1	95%UCL-H	Wlg>=Wt& Wno
Potassium	mg/kg	505	534	550		mg/kg	534	95%UCL-H	Wlg>=Wt& Wno	534	95%UCL-H	Wlg>=Wt& Wno
Silver	mg/kg	6 94	9 79	11.3	J	mg/kg	9 79	95%UCL-N	Wno>=Wt&>Wlg	9 79	95%UCL-N	Wno>=Wt&>Wlg
Sodium	mg/kg	2730	4560	4460	J	mg/kg	4460	Max	Max<95%UCL-H	2730	Mean-T	Mean-T<=Max
Vanadium	mg/kg	25 6	53 8	52.5		mg/kg	52.5	Max	Max<95%UCL-H	25 6	Mean-T	Mean-T<=Max
Zinc	mg/kg	120	229	228		mg/kg	228	Max	Max<95%UCL-H	120	Mean-T	Mean-T<=Max
Acenaphthylene	ug/kg	1240	1960	230	J	ug/kg	230	Max	Max<95%UCL-N	230	Max	Avg > Max
Anthracene	ug/kg	1100	5530	600	J	ug/kg	600	Max	Max<95%UCL-H	600	Max	Mean-T>Max
Benz(a)anthracene	ug/kg	1480	2050	1900	J	ug/kg	1900	Max	Max<95%UCL-N	1480	Mean-N	Avg <= Max
Benzo(a)pyrene	ug/kg	1230	1760	1400	J	ug/kg	1400	Max	Max<95%UCL-N	1230	Mean-N	Avg <= Max

TABLE 6-3.3 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Benzo(b)fluoranthene	ug/kg	1310	1830	1700	J	ug/kg	1700	Max	Max<95%UCL-N	1310	Mean-N	Avg <= Max
Benzo(g,h,i)perylene	ug/kg	1210	3670	790	J	ug/kg	790	Max	Max<95%UCL-H	790	Max	Mean-T>Max
Benzo(k)fluoranthene	ug/kg	1280	3460	720	J	ug/kg	720	Max	Max<95%UCL-H	720	Max	Mean-T>Max
Chrysene	ug/kg	1370	1900	1700	J	ug/kg	1700	Max	Max<95%UCL-N	1370	Mean-N	Avg <= Max
Dibenz(a,h)anthracene	ug/kg	1250	1960	290	J	ug/kg	290	Max	Max<95%UCL-N	290	Max	Avg > Max
Fluoranthene	ug/kg	2480	4070	4400		ug/kg	4070	95%UCL-N	Wno>=Wt&>Wlg	4070	95%UCL-N	Wno>=Wt&>Wlg
Indeno(1,2,3-cd)pyrene	ug/kg	1300	3180	1000	J	ug/kg	1000	Max	Max<95%UCL-H	1000	Max	Mean-T>Max
Phenanthrene	ug/kg	1780	2340	2300		ug/kg	2300	Max	Max<95%UCL-N	1780	Mean-N	Avg <= Max
Pyrene	ug/kg	2060	3300	3700		ug/kg	3300	95%UCL-N	Wno>=Wt&>Wlg	3300	95%UCL-N	Wno>=Wt&>Wlg
2-Butanone	ug/kg	6	7.31	8	J	ug/kg	7.31	95%UCL-H	Wlg>=Wt& Wno	7.31	95%UCL-H	Wlg>=Wt& Wno
Acetone	ug/kg	130	30100	42	J	ug/kg	42	Max	Max<95%UCL-H	42	Max	Mean-T>Max
Benzene	ug/kg	2.3	3.02	1	J	ug/kg	1	Max	Max<95%UCL-N	1	Max	Avg > Max
Bromomethane	ug/kg	2.5	2.84	2	J	ug/kg	2	Max	Max<95%UCL-N	2	Max	Avg > Max
Carbon Disulfide	ug/kg	7.5	113	27		ug/kg	27	Max	Max<95%UCL-H	7.5	Mean-T	Mean-T<=Max
Chloromethane	ug/kg	3.9	9.4	9		ug/kg	9	Max	Max<95%UCL-H	3.9	Mean-T	Mean-T<=Max
Methylene Chloride	ug/kg	2.8	4.64	4	J	ug/kg	4	Max	Max<95%UCL-H	2.8	Mean-T	Mean-T<=Max

Statistics: Maximum Detected Value (Max), 95% UCL of Normal Data (95% UCL-N), 95% UCL of Log-transformed Data (95% UCL-H); Mean of Log-transformed Data (Mean-T),
Mean of Normal Data (Mean-N)

TABLE 6-3.4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - BLUE MUSSELS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe
Medium. Blue Mussels
Exposure Medium Blue Mussels
Exposure Point. Ingestion and Dermal Contact

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Aluminum	mg/kg	101	161	212.6	J	mg/kg	161	95%UCL-N	Wno>=Wt&>Wlg	161	95%UCL-N	Wno>=Wt&>Wlg
Arsenic	mg/kg	1 81	2.29	2 7		mg/kg	2 29	95%UCL-N	Wno>=Wt&>Wlg	2 29	95%UCL-N	Wno>=Wt&>Wlg
Cadmium	mg/kg	10 2	15 3	17		mg/kg	15.3	95%UCL-H	Wlg>=Wt& Wno	15 3	95%UCL-H	Wlg>=Wt& Wno
Chromium	mg/kg	12 4	183000	40 5		mg/kg	40.5	Max	Max<95%UCL-H	12 4	Mean-T	Mean-T<=Max
Copper	mg/kg	4 74	11 1	10		mg/kg	10	Max	Max<95%UCL-H	4.74	Mean-T	Mean-T<=Max
Iron	mg/kg	431	495	538 2		mg/kg	495	95%UCL-N	Wno>=Wt&>Wlg	495	95%UCL-N	Wno>=Wt&>Wlg
Lead	mg/kg	4 61	5.79	6 3		mg/kg	4 62	Mean-T	IEUBK Uses LgAV	4 62	Mean-T	IEUBK Uses LgAV
Mercury	mg/kg	2 26	2.72	3		mg/kg	2 72	95%UCL-N	Wno>=Wt&>Wlg	2 72	95%UCL-N	Wno>=Wt&>Wlg
Nickel	mg/kg	8 56	10 7	12.4		mg/kg	10 7	95%UCL-H	Wlg>=Wt& Wno	10.7	95%UCL-H	Wlg>=Wt& Wno
Zinc	mg/kg	129	150	157.3		mg/kg	150	95%UCL-N	Wno>=Wt&>Wlg	150	95%UCL-N	Wno>=Wt&>Wlg
2,4'-DDD	ug/kg	2 86	3 51	3 971987		ug/kg	3 51	95%UCL-H	Wlg>=Wt& Wno	3 51	95%UCL-H	Wlg>=Wt& Wno
2,4'-DDT	ug/kg	1 73	2.69	2 931549	J	ug/kg	2.69	95%UCL-H	Wlg>=Wt& Wno	2 69	95%UCL-H	Wlg>=Wt& Wno
4,4'-DDD	ug/kg	7 41	9 05	10 572953		ug/kg	9 05	95%UCL-N	Wno>=Wt&>Wlg	9.05	95%UCL-N	Wno>=Wt&>Wlg
4,4'-DDE	ug/kg	13 7	18.1	19 068304		ug/kg	18 1	95%UCL-N	Wt >Wno> Wlg	18 1	95%UCL-N	Wt >Wno> Wlg
4,4'-DDT	ug/kg	4 05	4.7	5 410711		ug/kg	4 7	95%UCL-N	Wno>=Wt&>Wlg	4.7	95%UCL-N	Wno>=Wt&>Wlg
Alpha-Chlordane	ug/kg	3 94	5 19	4 928442		ug/kg	4.93	Max	Max<95%UCL-N	3 94	Mean-N	Avg <= Max
Dieldrin	ug/kg	4.56	5.77	6.414344		ug/kg	5 77	95%UCL-N	Wno>=Wt&>Wlg	5 77	95%UCL-N	Wno>=Wt&>Wlg
Endosulfan I	ug/kg	0 503	1.35	1.795762		ug/kg	1 35	95%UCL-H	Wlg>=Wt& Wno	1 35	95%UCL-H	Wlg>=Wt& Wno
Endosulfan II	ug/kg	1 52	9 38	3 030163		ug/kg	3 03	Max	Max<95%UCL-H	1.52	Mean-T	Mean-T<=Max
Gamma-BHC (Lindane)	ug/kg	0 482	0 661	0 722804		ug/kg	0 661	95%UCL-H	Wlg>=Wt& Wno	0 661	95%UCL-H	Wlg>=Wt& Wno
Heptachlor Epoxide	ug/kg	0 223	0.492	0.477647		ug/kg	0 478	Max	Max<95%UCL-H	0 223	Mean-T	Mean-T<=Max
Mirex	ug/kg	1 17	9.05	5 732104	J	ug/kg	5 73	Max	Max<95%UCL-H	1 17	Mean-T	Mean-T<=Max
Total PCB Congeners	ug/kg	346	492	683		ug/kg	492	95%UCL-H	Wt >Wlg>=Wno	492	95%UCL-H	Wt >Wlg>=Wno
trans-Nonachlor	ug/kg	3 75	4 09	4 310349		ug/kg	4 09	95%UCL-H	Wlg>=Wt& Wno	4 09	95%UCL-H	Wlg>=Wt& Wno
1,1-Biphenyl	ug/kg	1 73	2 57	3 436154		ug/kg	2 57	95%UCL-H	Wlg>=Wt& Wno	2 57	95%UCL-H	Wlg>=Wt& Wno
1-Methylnaphthalene	ug/kg	4 83	10	9 545828	J	ug/kg	9 55	Max	Max<95%UCL-H	4 83	Mean-T	Mean-T<=Max
1-Methylphenanthrene	ug/kg	4 01	5.03	5 306226	J	ug/kg	5 03	95%UCL-H	Wlg>=Wt& Wno	5.03	95%UCL-H	Wlg>=Wt& Wno

TABLE 6-3.4 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - BLUE MUSSELS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
2,3,5-Trimethylnaphthalene	ug/kg	2.6	3.7	5.343438		ug/kg	3.7	95%UCL-N	Wno>=Wt&>Wlg	3.7	95%UCL-N	Wno>=Wt&>Wlg
2,6-Dimethylnaphthalene	ug/kg	4.91	6.11	7.071235		ug/kg	6.11	95%UCL-H	Wlg>=Wt& Wno	6.11	95%UCL-H	Wlg>=Wt& Wno
2-Methylnaphthalene	ug/kg	8.4	18	17.228148	J	ug/kg	17.2	Max	Max<95%UCL-H	8.4	Mean-T	Mean-T<=Max
Acenaphthene	ug/kg	4.4	6.38	7.668564	J	ug/kg	6.38	95%UCL-H	Wlg>=Wt& Wno	6.38	95%UCL-H	Wlg>=Wt& Wno
Acenaphthylene	ug/kg	5.17	6.12	7.316881		ug/kg	6.12	95%UCL-H	Wlg>=Wt& Wno	6.12	95%UCL-H	Wlg>=Wt& Wno
Anthracene	ug/kg	8.41	9.85	11.259983	J	ug/kg	9.85	95%UCL-H	Wlg>=Wt& Wno	9.85	95%UCL-H	Wlg>=Wt& Wno
Benz(a)anthracene	ug/kg	12.9	15.9	18.296905		ug/kg	15.9	95%UCL-N	Wno>=Wt&>Wlg	15.9	95%UCL-N	Wno>=Wt&>Wlg
Benzo(a)pyrene	ug/kg	7.36	9.55	9.961397		ug/kg	9.55	95%UCL-H	Wlg>=Wt& Wno	9.55	95%UCL-H	Wlg>=Wt& Wno
Benzo(b)fluoranthene	ug/kg	14	18.8	23.387303		ug/kg	18.8	95%UCL-H	Wlg>=Wt& Wno	18.8	95%UCL-H	Wlg>=Wt& Wno
Benzo(e)pyrene	ug/kg	24.5	34.6	42.734624		ug/kg	34.6	95%UCL-H	Wlg>=Wt& Wno	34.6	95%UCL-H	Wlg>=Wt& Wno
Benzo(g,h,i)perylene	ug/kg	11.6	15.3	16.406995	J	ug/kg	15.3	95%UCL-H	Wlg>=Wt& Wno	15.3	95%UCL-H	Wlg>=Wt& Wno
Benzo(k)fluoranthene	ug/kg	14.4	19.7	23.226213		ug/kg	19.7	95%UCL-H	Wlg>=Wt& Wno	19.7	95%UCL-H	Wlg>=Wt& Wno
Chrysene	ug/kg	30.4	36.8	43.655942		ug/kg	36.8	95%UCL-H	Wlg>=Wt& Wno	36.8	95%UCL-H	Wlg>=Wt& Wno
Dibenz(a,h)anthracene	ug/kg	1.21	1.54	2.038155	J	ug/kg	1.54	95%UCL-H	Wlg>=Wt& Wno	1.54	95%UCL-H	Wlg>=Wt& Wno
Fluoranthene	ug/kg	72.2	92.6	109.615791		ug/kg	92.6	95%UCL-H	Wlg>=Wt& Wno	92.6	95%UCL-H	Wlg>=Wt& Wno
Fluorene	ug/kg	7.4	9.79	11.561423	J	ug/kg	9.79	95%UCL-N	Wno>=Wt&>Wlg	9.79	95%UCL-N	Wno>=Wt&>Wlg
Hexachlorobenzene	ug/kg	0.349	0.513	0.592772		ug/kg	0.513	95%UCL-H	Wlg>=Wt& Wno	0.513	95%UCL-H	Wlg>=Wt& Wno
Indeno(1,2,3-cd)pyrene	ug/kg	7.71	9.71	11.485193	J	ug/kg	9.71	95%UCL-N	Wno>=Wt&>Wlg	9.71	95%UCL-N	Wno>=Wt&>Wlg
Naphthalene	ug/kg	10	27.7	29.011531	J	ug/kg	27.7	95%UCL-H	Wt >Wlg>=Wno	27.7	95%UCL-H	Wt >Wlg>=Wno
Perylene	ug/kg	8.41	13.2	18.464083		ug/kg	13.2	95%UCL-N	Wno>=Wt&>Wlg	13.2	95%UCL-N	Wno>=Wt&>Wlg
Phenanthrene	ug/kg	22.2	27.9	32.021515	J	ug/kg	27.9	95%UCL-H	Wt >Wlg>=Wno	27.9	95%UCL-H	Wt >Wlg>=Wno
Pyrene	ug/kg	55.5	77	95.775813		ug/kg	77	95%UCL-H	Wlg>=Wt& Wno	77	95%UCL-H	Wlg>=Wt& Wno

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-H), Mean of Log-transformed Data (Mean-T), Mean of Normal Data (Mean-N).

TABLE 6-3.5
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - CLAMS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe
Medium Clams
Exposure Medium Clams
Exposure Point, Ingestion and Dermal Contact

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Aluminum	mg/kg	612	775	1203 8	J	mg/kg	775	95%UCL-N	Wno>=Wt&>Wlg	775	95%UCL-N	Wno>=Wt&>Wlg
Antimony	mg/kg	0 0183	0 0263	0 022		mg/kg	0 022	Max	n<5,use Max	0 0183	Mean-N	Avg <= Max
Arsenic	mg/kg	8 48	11 6	33 2		mg/kg	11 6	95%UCL-H	Wt >Wlg>=Wno	11 6	95%UCL-H	Wt >Wlg>=Wno
Barium	mg/kg	13 2	29 8	2 11		mg/kg	2 11	Max	Max<95%UCL-H	2 11	Max	Mean-T>Max
Beryllium	mg/kg	0 105	0 154	0 129		mg/kg	0 129	Max	n<5,use Max	0 105	Mean-N	Avg <= Max
Boron	mg/kg	26.9	40.4	31.8		mg/kg	31 8	Max	n<5,use Max	26 9	Mean-T	Mean-T<=Max
Cadmium	mg/kg	6 17	7 66	11 2		mg/kg	7 66	95%UCL-N	Wno>=Wt&>Wlg	7.66	95%UCL-N	Wno>=Wt&>Wlg
Calcium	mg/kg	7700	20200	10700		mg/kg	10700	Max	n<5,use Max	7700	Mean-T	Mean-T<=Max
Chromium	mg/kg	14 6	408	74 4		mg/kg	74 4	Max	Max<95%UCL-H	14 6	Mean-T	Mean-T<=Max
Cobalt	mg/kg	1 6	5 43	2 31		mg/kg	2 31	Max	n<5,use Max	1.6	Mean-T	Mean-T<=Max
Copper	mg/kg	4 37	6 06	10		mg/kg	6 06	95%UCL-H	Wt >Wlg>=Wno	6 06	95%UCL-H	Wt >Wlg>=Wno
Iron	mg/kg	251	313	438 6		mg/kg	313	95%UCL-H	Wlg>=Wt& Wno	313	95%UCL-H	Wlg>=Wt& Wno
Lead	mg/kg	5 45	6 5	9 9		mg/kg	5 45	Mean-N	IEUBK Uses AVG	5 45	Mean-N	IEUBK Uses AVG
Magnesium	mg/kg	8200	11200	10000		mg/kg	10000	Max	n<5,use Max	8200	Mean-N	Avg <= Max
Manganese	mg/kg	40 9	5700000	92 8		mg/kg	92 8	Max	n<5,use Max	40 9	Mean-T	Mean-T<=Max
Mercury	mg/kg	2 28	2 85	4		mg/kg	2 85	95%UCL-N	Wno>=Wt&>Wlg	2 85	95%UCL-N	Wno>=Wt&>Wlg
Nickel	mg/kg	19 9	22.5	29 3		mg/kg	22 5	95%UCL-H	Wlg>=Wt& Wno	22.5	95%UCL-H	Wlg>=Wt& Wno
Potassium	mg/kg	10200	11400	10900		mg/kg	10900	Max	n<5,use Max	10200	Mean-T	Mean-T<=Max
Selenium	mg/kg	0 843	24 6	1.48		mg/kg	1.48	Max	n<5,use Max	0 843	Mean-T	Mean-T<=Max
Silver	mg/kg	0.346	0 436	0 763		mg/kg	0 436	95%UCL-N	Wt >Wno> Wlg	0.436	95%UCL-N	Wt >Wno> Wlg
Sodium	mg/kg	62800	88500	76300		mg/kg	76300	Max	n<5,use Max	62800	Mean-N	Avg <= Max
Thallium	mg/kg	0 00267	0.00525	0 004		mg/kg	0.004	Max	n<5,use Max	0 00267	Mean-N	Avg <= Max
Vanadium	mg/kg	2.52	4.52	3 73		mg/kg	3.73	Max	n<5,use Max	2.52	Mean-N	Avg <= Max
Zinc	mg/kg	81.9	91	112		mg/kg	91	95%UCL-H	Wlg>=Wt& Wno	91	95%UCL-H	Wlg>=Wt& Wno
2,4'-DDD	ug/kg	4.88	14 7	17 283134		ug/kg	14.7	95%UCL-H	Wlg>=Wt& Wno	14.7	95%UCL-H	Wlg>=Wt& Wno

TABLE 6-3.5 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - CLAMS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
2,4'-DDT	ug/kg	0.808	2 24	2 242863		ug/kg	2 24	95%UCL-H	Wlg>=Wt& Wno	2.24	95%UCL-H	Wlg>=Wt& Wno
4,4'-DDD	ug/kg	1 68	2 39	6 796105	J	ug/kg	2 39	95%UCL-H	Wt >Wlg>=Wno	2 39	95%UCL-H	Wt >Wlg>=Wno
4,4'-DDE	ug/kg	3 45	4 19	5 869822		ug/kg	4 19	95%UCL-N	Wno>=Wt&>Wlg	4 19	95%UCL-N	Wno>=Wt&>Wlg
Alpha-Chlordane	ug/kg	1 25	1 43	1 886543		ug/kg	1 43	95%UCL-H	Wlg>=Wt& Wno	1 43	95%UCL-H	Wlg>=Wt& Wno
Aroclor-1254	ug/kg	51.3	849	85 54		ug/kg	85 5	Max	n<5,use Max	51 3	Mean-T	Mean-T<=Max
Dieldrin	ug/kg	3.13	3 57	4 556161		ug/kg	3 57	95%UCL-N	Wno>=Wt&>Wlg	3 57	95%UCL-N	Wno>=Wt&>Wlg
Endosulfan II	ug/kg	1 99	7	6 809299		ug/kg	6 81	Max	Max<95%UCL-H	1 99	Mean-T	Mean-T<=Max
Gamma-BHC (Lindane)	ug/kg	0 642	3 79	2.32353		ug/kg	2 32	Max	Max<95%UCL-H	0.642	Mean-T	Mean-T<=Max
Heptachlor	ug/kg	0.358	0 408	0 270997	J	ug/kg	0 271	Max	Max<95%UCL-N	0 271	Max	Avg > Max
Heptachlor Epoxide	ug/kg	0.154	0 174	0.193376		ug/kg	0.174	95%UCL-N	Wno>=Wt&>Wlg	0.174	95%UCL-N	Wno>=Wt&>Wlg
Mirex	ug/kg	0 565	0.848	3.6123	J	ug/kg	0 848	95%UCL-H	Wt >Wlg>=Wno	0.848	95%UCL-H	Wt >Wlg>=Wno
Total PCB Congeners	ug/kg	217	373	1080		ug/kg	373	95%UCL-H	Wt >Wlg>=Wno	373	95%UCL-H	Wt >Wlg>=Wno
trans-Nonachlor	ug/kg	1.05	1.31	1.689338		ug/kg	1.31	95%UCL-H	Wlg>=Wt& Wno	1.31	95%UCL-H	Wlg>=Wt& Wno
1,1-Biphenyl	ug/kg	3.99	8 21	18.39		ug/kg	8.21	95%UCL-H	Wt >Wlg>=Wno	8 21	95%UCL-H	Wt >Wlg>=Wno
1-Methylnaphthalene	ug/kg	2 72	4 24	19 314667		ug/kg	4 24	95%UCL-H	Wt >Wlg>=Wno	4 24	95%UCL-H	Wt >Wlg>=Wno
1-Methylphenanthrene	ug/kg	2 57	3 32	4 656825		ug/kg	3.32	95%UCL-H	Wlg>=Wt& Wno	3 32	95%UCL-H	Wlg>=Wt& Wno
2,3,5-Trimethylnaphthalene	ug/kg	1 02	1 2	1.663607		ug/kg	1 2	95%UCL-N	Wno>=Wt&>Wlg	1.2	95%UCL-N	Wno>=Wt&>Wlg
2,6-Dimethylnaphthalene	ug/kg	2	2.24	2.866485		ug/kg	2 24	95%UCL-H	Wlg>=Wt& Wno	2 24	95%UCL-H	Wlg>=Wt& Wno
2-Methylnaphthalene	ug/kg	3.65	5.51	24 485875		ug/kg	5.51	95%UCL-H	Wt >Wlg>=Wno	5.51	95%UCL-H	Wt >Wlg>=Wno
Acenaphthene	ug/kg	2 05	2 67	4.500314		ug/kg	2.67	95%UCL-H	Wlg>=Wt& Wno	2 67	95%UCL-H	Wlg>=Wt& Wno
Acenaphthylene	ug/kg	2 13	2 51	3.69	J	ug/kg	2 51	95%UCL-H	Wlg>=Wt& Wno	2 51	95%UCL-H	Wlg>=Wt& Wno
Anthracene	ug/kg	5 09	7 09	11.149569	J	ug/kg	7.09	95%UCL-H	Wlg>=Wt& Wno	7.09	95%UCL-H	Wlg>=Wt& Wno
Benz(a)anthracene	ug/kg	9.42	14.8	22.88		ug/kg	14 8	95%UCL-H	Wlg>=Wt& Wno	14 8	95%UCL-H	Wlg>=Wt& Wno
Benzo(a)pyrene	ug/kg	6.15	9.44	14 72		ug/kg	9 44	95%UCL-H	Wlg>=Wt& Wno	9 44	95%UCL-H	Wlg>=Wt& Wno
Benzo(b)fluoranthene	ug/kg	10 3	15.1	41 6		ug/kg	15 1	95%UCL-H	Wlg>=Wt& Wno	15 1	95%UCL-H	Wlg>=Wt& Wno
Benzo(e)pyrene	ug/kg	12 8	17	34 87		ug/kg	17	95%UCL-H	Wlg>=Wt& Wno	17	95%UCL-H	Wlg>=Wt& Wno
Benzo(g,h,i)perylene	ug/kg	6 83	13.1	25 03		ug/kg	13 1	95%UCL-H	Wlg>=Wt& Wno	13 1	95%UCL-H	Wlg>=Wt& Wno
Benzo(k)fluoranthene	ug/kg	8 31	10.4	14 809127		ug/kg	10 4	95%UCL-N	Wno>=Wt&>Wlg	10 4	95%UCL-N	Wno>=Wt&>Wlg
Chrysene	ug/kg	16.1	19 2	27 301548		ug/kg	19 2	95%UCL-N	Wno>=Wt&>Wlg	19 2	95%UCL-N	Wno>=Wt&>Wlg

TABLE 6-3.5 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - CLAMS
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Dibenz(a,h)anthracene	ug/kg	1 05	1.45	2 98	J	ug/kg	1.45	95%UCL-H	Wlg>=Wt& Wno	1 45	95%UCL-H	Wlg>=Wt& Wno
Dibenzofuran	ug/kg	5 81	7 13	6 37	J	ug/kg	6 37	Max	n<5,use Max	5 81	Mean-N	Avg <= Max
Dibenzothiophene	ug/kg	1 9	5 04	2 63	J	ug/kg	2 63	Max	n<5,use Max	1 9	Mean-T	Mean-T<=Max
Fluoranthene	ug/kg	39 8	49 4	75.83		ug/kg	49 4	95%UCL-H	Wlg>=Wt& Wno	49 4	95%UCL-H	Wlg>=Wt& Wno
Fluorene	ug/kg	2.4	3 31	6.24		ug/kg	3.31	95%UCL-H	Wlg>=Wt& Wno	3.31	95%UCL-H	Wlg>=Wt& Wno
Hexachlorobenzene	ug/kg	0.719	0 859	1 087834		ug/kg	0 859	95%UCL-N	Wno>=Wt&>Wlg	0 859	95%UCL-N	Wno>=Wt&>Wlg
Indeno(1,2,3-cd)pyrene	ug/kg	4 67	9.65	16 78		ug/kg	9.65	95%UCL-H	Wlg>=Wt& Wno	9.65	95%UCL-H	Wlg>=Wt& Wno
Naphthalene	ug/kg	21 2	78	106 57	B	ug/kg	78	95%UCL-H	Wt >Wlg>=Wno	78	95%UCL-H	Wt >Wlg>=Wno
Perylene	ug/kg	1.88	2.78	6 44		ug/kg	2 78	95%UCL-H	Wlg>=Wt& Wno	2.78	95%UCL-H	Wlg>=Wt& Wno
Phenanthrene	ug/kg	14 8	19 2	29 37		ug/kg	19 2	95%UCL-H	Wlg>=Wt& Wno	19.2	95%UCL-H	Wlg>=Wt& Wno
Pyrene	ug/kg	32 7	39 9	66.46		ug/kg	39 9	95%UCL-H	Wlg>=Wt& Wno	39.9	95%UCL-H	Wlg>=Wt& Wno

Statistics Maximum Detected Value (Max), 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-H), Mean of Log-transformed Data (Mean-T), Mean of Normal Data (Mean-N).

TABLE 6-3.6
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - LOBSTER
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe
Medium Lobster
Exposure Medium Lobster
Exposure Point, Ingestion and Dermal Contact

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
Aluminum	mg/kg	365	377	397 3		mg/kg	377	95%UCL-N	Wno>=Wt&>Wlg	377	95%UCL-N	Wno>=Wt&>Wlg
Arsenic	mg/kg	7 9	8 55	10.2		mg/kg	8 55	95%UCL-N	Wno>=Wt&>Wlg	8 55	95%UCL-N	Wno>=Wt&>Wlg
Cadmium	mg/kg	4 3	12.7	13 3		mg/kg	12 7	95%UCL-H	Wlg>=Wt& Wno	12 7	95%UCL-H	Wlg>=Wt& Wno
Chromium	mg/kg	15 4	17.1	21.1		mg/kg	17.1	95%UCL-N	Wno>=Wt&>Wlg	17 1	95%UCL-N	Wno>=Wt&>Wlg
Copper	mg/kg	150	162	194 2		mg/kg	162	95%UCL-N	Wno>=Wt&>Wlg	162	95%UCL-N	Wno>=Wt&>Wlg
Iron	mg/kg	119	134	160.3		mg/kg	134	95%UCL-N	Wno>=Wt&>Wlg	134	95%UCL-N	Wno>=Wt&>Wlg
Lead	mg/kg	15 9	17 2	19		mg/kg	15 9	Mean-N	IEUBK Uses AVG	15 9	Mean-N	IEUBK Uses AVG
Mercury	mg/kg	2 6	3 53	7.2		mg/kg	3 53	95%UCL-H	Wt >Wlg>=Wno	3 53	95%UCL-H	Wt >Wlg>=Wno
Nickel	mg/kg	36 5	39	44.9		mg/kg	39	95%UCL-N	Wno>=Wt&>Wlg	39	95%UCL-N	Wno>=Wt&>Wlg
Silver	mg/kg	3.05	3 5	5		mg/kg	3.5	95%UCL-H	Wlg>=Wt& Wno	3 5	95%UCL-H	Wlg>=Wt& Wno
Zinc	mg/kg	263	273	297 5		mg/kg	273	95%UCL-N	Wno>=Wt&>Wlg	273	95%UCL-N	Wno>=Wt&>Wlg
2,4'-DDD	ug/kg	0 303	0 417	0 6922		ug/kg	0 417	95%UCL-H	Wlg>=Wt& Wno	0 417	95%UCL-H	Wlg>=Wt& Wno
2,4'-DDT	ug/kg	0 52	0 626	0 787354	J	ug/kg	0 626	95%UCL-N	Wno>=Wt&>Wlg	0.626	95%UCL-N	Wno>=Wt&>Wlg
4,4'-DDD	ug/kg	0 836	1 04	1 567613	J	ug/kg	1 04	95%UCL-N	Wno>=Wt&>Wlg	1 04	95%UCL-N	Wno>=Wt&>Wlg
4,4'-DDE	ug/kg	9 05	13	22 048708		ug/kg	13	95%UCL-H	Wlg>=Wt& Wno	13	95%UCL-H	Wlg>=Wt& Wno
4,4'-DDT	ug/kg	0 323	0.418	0 627459	J	ug/kg	0.418	95%UCL-N	Wno>=Wt&>Wlg	0 418	95%UCL-N	Wno>=Wt&>Wlg
Alpha-Chlordane	ug/kg	0 456	0 668	1.344033		ug/kg	0.668	95%UCL-H	Wlg>=Wt& Wno	0 668	95%UCL-H	Wlg>=Wt& Wno
Dieldrin	ug/kg	3.73	4.47	6.273958		ug/kg	4 47	95%UCL-H	Wlg>=Wt& Wno	4 47	95%UCL-H	Wlg>=Wt& Wno
Endosulfan II	ug/kg	0.617	0 736	0.843737		ug/kg	0.736	95%UCL-N	Wno>=Wt&>Wlg	0 736	95%UCL-N	Wno>=Wt&>Wlg
Gamma-BHC (Lindane)	ug/kg	1.06	1 35	1.895638		ug/kg	1.35	95%UCL-N	Wno>=Wt&>Wlg	1 35	95%UCL-N	Wno>=Wt&>Wlg
Heptachlor Epoxide	ug/kg	0.129	0.152	0.084338	J	ug/kg	0.0843	Max	Max<95%UCL-H	0.0843	Max	Mean-T>Max
Mirex	ug/kg	0 221	0 314	0.497562		ug/kg	0.314	95%UCL-H	Wlg>=Wt& Wno	0.314	95%UCL-H	Wlg>=Wt& Wno
Total PCB Congeners	ug/kg	235	265	331		ug/kg	265	95%UCL-H	Wlg>=Wt& Wno	265	95%UCL-H	Wlg>=Wt& Wno
trans-Nonachlor	ug/kg	0 392	0 549	0.690496		ug/kg	0 549	95%UCL-H	Wlg>=Wt& Wno	0 549	95%UCL-H	Wlg>=Wt& Wno
1,1-Biphenyl	ug/kg	0.632	0 749	0 987034	J	ug/kg	0 749	95%UCL-H	Wlg>=Wt& Wno	0.749	95%UCL-H	Wlg>=Wt& Wno
1-Methylnaphthalene	ug/kg	4.17	6 55	11 725334		ug/kg	6.55	95%UCL-H	Wt >Wlg>=Wno	6 55	95%UCL-H	Wt >Wlg>=Wno

TABLE 6-3.6 (continued)
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - LOBSTER
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifer	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPA Rationale
1-Methylphenanthrene	ug/kg	2 03	3 14	4.068748		ug/kg	3.14	95%UCL-H	Wlg>=Wt& Wno	3.14	95%UCL-H	Wlg>=Wt& Wno
2,3,5-Trimethylnaphthalene	ug/kg	0.822	1 45	2 073974		ug/kg	1.45	95%UCL-H	Wlg>=Wt& Wno	1 45	95%UCL-H	Wlg>=Wt& Wno
2,6-Dimethylnaphthalene	ug/kg	1 66	2	2 365673	J	ug/kg	2	95%UCL-N	Wno>=Wt&>Wlg	2	95%UCL-N	Wno>=Wt&>Wlg
2-Methylnaphthalene	ug/kg	6 61	11 7	16 784856		ug/kg	11 7	95%UCL-H	Wlg>=Wt& Wno	11.7	95%UCL-H	Wlg>=Wt& Wno
Acenaphthene	ug/kg	1.75	3.12	7 50818		ug/kg	3 12	95%UCL-H	Wlg>=Wt& Wno	3 12	95%UCL-H	Wlg>=Wt& Wno
Anthracene	ug/kg	1 48	3 05	4 44318	J	ug/kg	3 05	95%UCL-H	Wlg>=Wt& Wno	3 05	95%UCL-H	Wlg>=Wt& Wno
Benz(a)anthracene	ug/kg	16.6	94 6	101 610533		ug/kg	94 6	95%UCL-H	Wlg>=Wt& Wno	94 6	95%UCL-H	Wlg>=Wt& Wno
Benzo(a)pyrene	ug/kg	32.9	172	258 536201		ug/kg	172	95%UCL-H	Wlg>=Wt& Wno	172	95%UCL-H	Wlg>=Wt& Wno
Benzo(b)fluoranthene	ug/kg	40.8	187	315 446617		ug/kg	187	95%UCL-H	Wlg>=Wt& Wno	187	95%UCL-H	Wlg>=Wt& Wno
Benzo(e)pyrene	ug/kg	18.9	49 7	108 100437		ug/kg	49.7	95%UCL-H	Wlg>=Wt& Wno	49.7	95%UCL-H	Wlg>=Wt& Wno
Benzo(g,h,i)perylene	ug/kg	8 82	20.2	41.835148		ug/kg	20 2	95%UCL-H	Wlg>=Wt& Wno	20 2	95%UCL-H	Wlg>=Wt& Wno
Benzo(k)fluoranthene	ug/kg	22 6	89 1	160 536235		ug/kg	89 1	95%UCL-H	Wlg>=Wt& Wno	89 1	95%UCL-H	Wlg>=Wt& Wno
Chrysene	ug/kg	39.3	118	225 036088		ug/kg	118	95%UCL-H	Wlg>=Wt& Wno	118	95%UCL-H	Wlg>=Wt& Wno
Dibenz(a,h)anthracene	ug/kg	1 82	3 74	12 081393		ug/kg	3 74	95%UCL-H	Wt >Wlg>=Wno	3 74	95%UCL-H	Wt >Wlg>=Wno
Fluoranthene	ug/kg	54.1	125	212 243442		ug/kg	125	95%UCL-H	Wlg>=Wt& Wno	125	95%UCL-H	Wlg>=Wt& Wno
Fluorene	ug/kg	1 35	1.99	2.634582		ug/kg	1 99	95%UCL-H	Wlg>=Wt& Wno	1.99	95%UCL-H	Wlg>=Wt& Wno
Hexachlorobenzene	ug/kg	0.379	0 427	0.547835		ug/kg	0 427	95%UCL-N	Wno>=Wt&>Wlg	0.427	95%UCL-N	Wno>=Wt&>Wlg
Indeno(1,2,3-cd)pyrene	ug/kg	15 9	101	114 478557	J	ug/kg	101	95%UCL-H	Wlg>=Wt& Wno	101	95%UCL-H	Wlg>=Wt& Wno
Naphthalene	ug/kg	8 62	13.3	19 805924		ug/kg	13 3	95%UCL-H	Wt >Wlg>=Wno	13 3	95%UCL-H	Wt >Wlg>=Wno
Perylene	ug/kg	5.49	11	10 356547		ug/kg	10 4	Max	Max<95%UCL-H	5 49	Mean-T	Mean-T<=Max
Phenanthrene	ug/kg	6 18	8 54	14 592396		ug/kg	8.54	95%UCL-N	Wno>=Wt&>Wlg	8 54	95%UCL-N	Wno>=Wt&>Wlg
Pyrene	ug/kg	43 6	121	159.98439		ug/kg	121	95%UCL-H	Wlg>=Wt& Wno	121	95%UCL-H	Wlg>=Wt& Wno

Statistics Maximum Detected Value (Max), 95% UCL of Normal Data (95% UCL-N), 95% UCL of Log-transformed Data (95% UCL-H), Mean of Log-transformed Data (Mean-T), Mean of Normal Data (Mean-N)

TABLE 6-4.1
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME SHORELINE VISITOR CHILD (AGE 1-4) CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium Sediment
Exposure Point: Contact (via ingestion) with Sediment
Receptor Population Shoreline Visitor
Receptor Age: Child (Age 1-4)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	Intake (mg/kg-day) = CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	IR-S	Ingestion Rate of Sediment	mg/day	100	Prof. Judge	
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	
	EF	Exposure Frequency	days/year	12	Prof. Judge	
	ED	Exposure Duration	years	4	Age 1 through 4	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	BW	Body Weight	kg	14 3	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	1460	EPA, 1989	

Notes/Sources
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment Fraction ingested is 100% from source.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC
EPA, 1997 Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989. Office of Research and Development.

TABLE 6-4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME SHORELINE VISITOR CHILD (AGE 1-4) CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Sediment
Exposure Medium. Sediment
Exposure Point: Contact (via dermal absorption) with Sediment
Receptor Population Shoreline Visitor
Receptor Age: Child (Age 1-4)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA-ADJ	Age-Adjusted Skin Surface Area/Body Wt Ratio	cm2-years/kg	243	(b)	CS x SA-ADJ x SSAF x DABS x EV x EF x CF3 x 1/AT
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2/event	0 4	EPA, 1998	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	
	EV	Event Frequency	events/day	1	(d)	
	EF	Exposure Frequency	days/year	12	Prof Judge	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	1460	EPA, 1989	

Notes/Sources:
(a) EPC = Calculated Exposure Point Concentration.
(b). Surface Area adjusted represented by hands and feet.
(c) Various sources as provided by EPA Region I
(d) Professional Judgment. 1 Event per day.
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC
EPA, 1997 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Supplemental Guidance Dermal Risk Assessment (Interim Guidance) EPA Region I
EPA, 1998. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual. Supplemental Guidance. Dermal Risk Assessment (Interim Guidance). Region I EPA

TABLE 6-4.3
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME SHORELINE VISITOR CHILD (AGE 5-12) CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point Contact (via ingestion) with Sediment
Receptor Population: Shoreline Visitor
Receptor Age. Child (Age 5-12)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	100	Prof Judge	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	0 6	(b)	
	EF	Exposure Frequency	days/year	24	Prof Judge	
	ED	Exposure Duration	years	8	Age 5 through 12	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	BW	Body Weight	kg	31 2	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2920	EPA, 1989	

Notes/Sources:
(a). EPC = Calculated Exposure Point Concentration.
(b) Professional Judgment Fraction ingested is approximately 2/3 from the site.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989 Office of Research and Development.

TABLE 6-4.4
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME SHORELINE VISITOR CHILD (AGE 5-12) CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Contact (via dermal absorption) with Sediment
Receptor Population Shoreline Visitor
Receptor Age: Child (Age 5-12)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA-ADJ	Age-Adjusted Skin Surface Area/Body Wt. Ratio	cm2-years/kg	352	(b)	CS x SA-ADJ x SSAF x DABS x EV x EF x CF3 x 1/AT
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2/event	0 4	EPA, 1998	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	
	EV	Event Frequency	events/day	1	(d)	
	EF	Exposure Frequency	days/year	24	Prof Judge	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2920	EPA, 1989	

Notes/Sources
(a) EPC = Calculated Exposure Point Concentration
(b) Surface Area adjusted represented by hands and feet
(c) Various sources as provided by EPA Region I
(d) Professional Judgment 1 Event per day.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC
EPA, 1997 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Supplemental Guidance Dermal Risk Assessment (Interim Guidance). EPA Region I
EPA, 1998. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment (Interim Guidance) Region I EPA

TABLE 6-4.5
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL CHILD (AGE 1-4) CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Contact (via ingestion) with Surface Soil
Receptor Population. Recreational
Receptor Age: Child (Age 1-4)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1997	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	
	EF	Exposure Frequency	days/year	48	(c)	
	ED	Exposure Duration	years	4	Age 1 through 4	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	BW	Body Weight	kg	14.3	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	1460	EPA, 1989	

Notes/Sources:
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment. Fraction ingested is 100% from source
(c) 48 days/year = (2 days/week * 12 weeks/yr) + (1 day/week * 24 weeks/year)
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC.
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989. Office of Research and Development.

TABLE 6-4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL CHILD (AGE 1-4) CONTACT WITH SURFACE SOIL

OLD FIRE FIGHTING TRAINING AREA

FINAL REMEDIAL INVESTIGATION

NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium. Surface Soil
Exposure Medium Surface Soil
Exposure Point Contact (via dermal absorption) with Surface Soil
Receptor Population: Recreational
Receptor Age Child (Age 1-4)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA-ADJ	Age-Adjusted Skin Surface Area/Body Wt Ratio	cm2-years/kg	807	(b)	CS x SA-ADJ x SSAF x DABS x EV x EF x CF3 x 1/AT
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2/event	0 2	EPA, 1997	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	
	EV	Event Frequency	events/day	1	(d)	
	EF	Exposure Frequency	days/year	48	(e)	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	1460	EPA, 1989	

Notes/Sources.

(a) EPC = Calculated Exposure Point Concentration

(b). Surface Area adjusted represented by hands, head, feet, forearms, and lower legs

(c). Various sources as provided by EPA Region I

(d). Professional Judgment 1 Event per day

(e) 48 days/year = (2 days/week * 12 weeks/yr) + (1 day/week * 24 weeks/year)

EPA, 1985 Development of Statistical Distributions of Ranges of Standard Factors Used in Exposure Assessments EPA 600/8-85/010 Office of Research and Development

EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response. Washington, DC

EPA, 1997. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) Supplemental Guidance Dermal Risk Assessment (Interim Guidance) EPA Region I

TABLE 6-4.7
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL CHILD (AGE 1 - 4) CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Particulates
Exposure Point: Contact (Inhalation) with Particulates in Surface Soil
Receptor Population: Recreational
Receptor Age: Child (Age 1 - 4)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1 32E+09	EPA, 1996	(CS/PEF) x IN x ET x EF x ED x 1/(BW x AT)
	IN	Inhalation Rate	m3/hr	1 2	EPA, 1997	
	ET	Exposure Time	hr/day	5	(b)	
	EF	Exposure Frequency	days/year	48	(c)	
	ED	Exposure Duration	years	4	EPA, 1997	
	BW	Body Weight	kg	14 3	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	1460	EPA, 1989	

Notes/Sources:
(a) EPC = Calculated Exposure Point Concentration.
(b) Professional Judgment 5 hours of exposure based on time at site.
(c). 48 days/year = (2 days/week * 12 weeks/yr) + (1 day/week * 24 weeks/year)
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC
EPA, 1996 Soil Screening Guidance, Users Guide Office of Emergency and Remedial Response EPA 540/R-96/018
EPA, 1997 Exposure Factors Handbook. Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development.

TABLE 6-4.8
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL CHILD (AGE 5-12) CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium. Surface Soil
Exposure Point Contact (via ingestion) with Surface Soil
Receptor Population: Recreational
Receptor Age Child (Age 5-12)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	125	(b)	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	0 6	(c)	
	EF	Exposure Frequency	days/year	75	(d)	
	ED	Exposure Duration	years	8	Age 5 through 12	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	BW	Body Weight	kg	31.2	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2920	EPA, 1989	

Notes/Sources
(a). EPC = Calculated Exposure Point Concentration
(b) EPA, 1997 (100 mg/day) + Additional exposure based on Professional Judgement
(c) Professional Judgment. Fraction ingested is approximately 2/3 from the site
(d) 75 days/year = [(Camp 5 days/week * 10 weeks) + (Baseball 2 days/week * 12 weeks/yr) * 20% reduction in days for weather)]+ [(General Recreation And Picnics 15 days/week)]
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989. Office of Research and Development.

TABLE 6-4.9
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL CHILD (AGE 5-12) CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium Surface Soil
Exposure Medium Surface Soil
Exposure Point Contact (via dermal absorption) with Surface Soil
Receptor Population: Recreational
Receptor Age Child (Age 5-12)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA-ADJ	Age-Adjusted Skin Surface Area/Body Wt. Ratio	cm2-years/kg	1159	(b)	CS x SA-ADJ x SSAF x DABS x EV x EF x CF3 x 1/AT
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2/event	0 2	EPA, 1997	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	
	EV	Event Frequency	events/day	1	(d)	
	EF	Exposure Frequency	days/year	75	(e)	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2920	EPA, 1989	

Notes/Sources
(a). EPC = Calculated Exposure Point Concentration.
(b) Surface Area adjusted represented by hands, head, feet, forearms, and lower legs.
(c). Various sources as provided by EPA Region I
(d). Professional Judgment 1 Event per day.
(e) 75 days/year = [(Camp 5 days/week * 10 weeks) + (Baseball 2 days/week * 12 weeks/yr) * 20% reduction in days for weather)]+ [(General Recreation And Picnics 15 days/week)]

EPA, 1985. Development of Statistical Distributions of Ranges of Standard Factors Used in Exposure Assessments. EPA 600/8-85/010. Office of Research and Development.
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.
EPA, 1997. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Supplemental Guidance. Dermal Risk Assessment (Interim Guidance). EPA Region I.

TABLE 6-4.10
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL CHILD (AGE 5 - 12) CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium Particulates
Exposure Point: Contact (Inhalation) with Particulates in Surface Soil
Receptor Population Recreational
Receptor Age. Child (Age 5 - 12)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1 32E+09	EPA, 1996	(CS/PEF) x IN x ET x EF x ED x 1/(BW x AT)
	IN	Inhalation Rate	m3/hr	1 2	EPA, 1997	
	ET	Exposure Time	hr/day	5	(b)	
	EF	Exposure Frequency	days/year	75	(c)	
	ED	Exposure Duration	years	8	EPA, 1997	
	BW	Body Weight	kg	31 2	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2920	EPA, 1989	

Notes/Sources

(a) EPC = Calculated Exposure Point Concentration

(b) Professional Judgment. 5 hours of exposure based on time at site

(c). 75 days/year = [(Camp 5 days/week * 10 weeks) + (Baseball 2 days/week * 12 weeks/yr) * 20% reduction in days for weather)]+ [(General Recreation And Picnics 15 days/week)]

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response. Washington, DC

EPA, 1996 Soil Screening Guidance, Users Guide Office of Emergency and Remedial Response. EPA 540/R-96/018

EPA, 1997. Exposure Factors Handbook. Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.11
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL ADULT CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium Surface Soil
Exposure Medium. Surface Soil
Exposure Point: Contact (via ingestion) with Surface Soil
Receptor Population Recreational
Receptor Age. Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	0.6	(b)	
	EF	Exposure Frequency	days/year	48	(c)	
	ED	Exposure Duration	years	18	--	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	6570	EPA, 1989	

Notes/Sources:
(a). EPC = Calculated Exposure Point Concentration
(b) Professional Judgment Fraction ingested is approximately 2/3 from the site.
(c). 48 days/year = (2 days/week * 12 weeks/yr) + (1 day/week * 24 weeks/year)
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC
EPA, 1997. Exposure Factors Handbook. Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.12
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL ADULT CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium· Surface Soil
Exposure Medium. Surface Soil
Exposure Point Contact (via dermal absorption) with Surface Soil
Receptor Population Recreational
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm2	7014	(b)	CS x SA x SSAF x DABS x EV x EF x ED x CF3 x 1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2/event	0.08	EPA, 1997b	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	
	EV	Event Frequency	events/day	1	(d)	
	EF	Exposure Frequency	days/year	48	(e)	
	ED	Exposure Duration	years	18	--	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997a	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	6570	EPA, 1989	

Notes/Sources
(a) EPC = Calculated Exposure Point Concentration
(b). Surface Area represented by hands, head, feet, forearms, and lower legs.
(c) Various sources as provided by EPA Region I
(d). Professional Judgment 1 Event per day.
(e). 48 days/year = (2 days/week * 12 weeks/yr) + (1 day/week * 24 weeks/year)

EPA, 1985 Development of Statistical Distributions of Ranges of Standard Factors Used in Exposure Assessments EPA 600/8-85/010 Office of Research and Development
EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC
EPA, 1997a. Exposure Factors Handbook. Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989 Office of Research and Development.
EPA, 1997b. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) Supplemental Guidance Dermal Risk Assessment (Interim Guidance) EPA Region I.

TABLE 6-4.13
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME RECREATIONAL ADULT CONTACT WITH SURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium Surface Soil
Exposure Medium Particulates
Exposure Point Contact (Inhalation) with Particulates in Surface Soil
Receptor Population Recreational
Receptor Age. Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	Intake (mg/kg-day) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1 32E+09	EPA, 1996	(CS/PEF) x IN x ET x EF x ED x 1/(BW x AT)
	IN	Inhalation Rate	m3/hr	1.6	EPA, 1997	
	ET	Exposure Time	hr/day	5	(b)	
	EF	Exposure Frequency	days/year	48	(c)	
	ED	Exposure Duration	years	18	--	
	BW	Body Weight	kg	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	6570	EPA, 1989	

Notes/Sources
(a). EPC = Calculated Exposure Point Concentration.
(b) Professional Judgment. 5 hours of exposure based on time at site
(c) 48 days/year = (2 days/week * 12 weeks/yr) + (1 day/week * 24 weeks/year)

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC.
EPA, 1996. Soil Screening Guidance, Users Guide. Office of Emergency and Remedial Response EPA 540/R-96/018
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989. Office of Research and Development

TABLE 6-4.14
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL CHILD CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium. Sediment
Exposure Medium Sediment
Exposure Point Contact (via ingestion) with Sediment
Receptor Population Resident
Receptor Age. Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Sediment	mg/day	100	Prof Judge	NA	Prof. Judge	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	6	Age 1 through 6	NA	Age 3 through 4	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	16 6	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	NA	EPA, 1989	

Notes/Sources.

NA - Not Applicable

Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment

(a) EPC = Calculated Exposure Point Concentration

(b) Professional Judgment. Fraction ingested is 100% from source.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response. Washington, DC.

EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.

EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989. Office of Research and Development.

TABLE 6-4.15
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL CHILD CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium Sediment
Exposure Medium. Sediment
Exposure Point Contact (via dermal absorption) with Sediment
Receptor Population Resident
Receptor Age Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	NA	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA-ADJ	Age-Adjusted Skin Surface Area/Body Wt Ratio	cm2-years/kg	341	(b)	NA	(d)	CS x SA-ADJ x SSAF x DABS x EV x EF x CF3 x 1/AT
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2/event	0 4	EPA, 1997	NA	EPA, 1997	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	EPA, 1995	NA	EPA, 1995	
	EV	Event Frequency	events/day	1	(c)	NA	(c)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	NA	EPA, 1989	

Notes/Sources:
NA - Not Applicable
Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment.
(a). EPC = Calculated Exposure Point Concentration
(b) Surface Area adjusted represented by hands and feet of child (age 1-6).
(c) Professional Judgment 1 Event per day.
(d) Surface Area adjusted represented by hands and feet of child (age 3-4)
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC
EPA, 1994. EPA Region I, Risk Updates August 1994, Volume II.
EPA, 1995. Assessing Dermal Exposure from Sediment, EPA Region III Technical Guidance Manual, EPA/903-K-95-003. December
EPA, 1997. Exposure Factors Handbook. Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989 Office of Research and Development.

TABLE 6-4.16
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL ADULT CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium. Sediment
Exposure Point Contact (via ingestion) with Sediment
Receptor Population Resident
Receptor Age. Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	50	EPA, 1997	NA	EPA, 1997	CS x IR-S x FI x EF x ED x CF1 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997	NA	EPA, 1997	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	70	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	NA	EPA, 1989	

Notes/Sources.
NA - Not Applicable
Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment.
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment. Fraction ingested is 100% from source

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response
EPA, 1993. Superfund's Standard Default Exposure Factors for Central Tendency and Reasonable Maximum Exposure Draft
EPA, 1994 EPA Region I, Risk Updates August 1994, Volume II
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.17
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL ADULT CONTACT WITH SEDIMENT
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Sediment
Exposure Medium. Sediment
Exposure Point. Contact (via dermal absorption) with Sediment
Receptor Population Resident
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CS	Chemical Concentration in Sediment	mg/kg	See EPC	(a)	NA	(a)	Dermal Absorbed Dose (mg/kg-day) = CS x SA x SSAF x DABS x EV x EF x ED x CF3 x 1/(BW x AT)
	SA	Skin Surface Area Available for Contact	cm2	2129	(b)	NA	(b)	
	SSAF	Sediment-to-Skin Adherence Factor	mg/cm2/event	0.4	EPA, 1997	NA	EPA, 1997	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	EPA, 1995	NA	EPA, 1995	
	EV	Event Frequency	events/day	1	(c)	NA	(c)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997	NA	EPA, 1997	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	70	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	NA	EPA, 1989	

Notes/Sources
NA - Not Applicable
Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment
(a) EPC = Calculated Exposure Point Concentration
(b) Surface Area represented by hands and feet.
(c) Professional Judgment 1 Event per day
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response
EPA, 1994 EPA Region I, Risk Updates August 1994, Volume II
EPA, 1995. Assessing Dermal Exposure from Soil, EPA Region III Technical Guidance Manual, EPA/903-K-95-003 December
EPA, 1997 Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.18
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL CHILD CONTACT WITH SURFACE SOIL*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium Surface Soil
Exposure Medium Surface Soil
Exposure Point. Contact (via ingestion) with Surface Soil
Receptor Population Residential
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	EPA, 1997	NA	EPA, 1994	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	6	Age 1 through 6	NA	Age 3 through 4	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	16 6	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	NA	EPA, 1989	

Notes/Sources.
NA - Not Applicable
*These exposure parameters are also valid for Future/Subsurface Soil/Contact (via ingestion) with Subsurface Soil at Site 09 - Newport, Rhode Island
(a) EPC = Calculated Exposure Point Concentration
(b). Professional Judgment Fraction ingested is 100% from source
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989. Office of Research and Development

TABLE 6-4.19
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL CHILD CONTACT WITH SURFACE SOIL*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium Surface Soil
Exposure Medium Surface Soil
Exposure Point Contact (via dermal absorption) with Surface Soil
Receptor Population· Residential
Receptor Age· Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA-ADJ	Age-Adjusted Skin Surface Area/Body Wt Ratio	cm2-years/kg	1136	(b)	NA	(e)	CS x SA-ADJ x SSAF x DABS x EV x EF x CF3 x 1/AT
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2/event	0 2	EPA, 1997b	NA	EPA, 1997b	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	NA	(c)	
	EV	Event Frequency	events/day	1	(d)	NA	(d)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	NA	EPA, 1989	

Notes/Sources
NA - Not Applicable
*These exposure parameters are also valid for Future/Subsurface Soil/Contact (via dermal absorption) with Subsurface Soil at Site 09 - Newport, Rhode Island.
(a) EPC = Calculated Exposure Point Concentration
(b) Surface Area adjusted represented by hands, head, feet, forearms, and lower legs of child (age 1-6).
(c). Various sources as provided by EPA Region I
(d) Professional Judgment. 1 Event per day.
(e) Surface Area adjusted represented by hands, head, feet, forearms, and lower legs of child (age 3-4)
EPA, 1985 Development of Statistical Distributions of Ranges of Standard Factors Used in Exposure Assessments. EPA 600/8-85/010 Office of Research and Development
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997a. Exposure Factors Handbook. Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development
EPA, 1997b. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) Supplemental Guidance Dermal Risk Assessment (Interim Guidance). EPA Region I

TABLE 6-4.20
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL CHILD CONTACT WITH SURFACE SOIL*
OLD FIRE FIGHTING TRAINING ARE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium Surface Soil
Exposure Medium Particulates
Exposure Point: Inhalation of Particulates in Surface Soil
Receptor Population Residential
Receptor Age Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1.32E+09	EPA, 1996	NA	EPA, 1996	(CS/PEF) x IN x ET x EF x ED x 1/(BW x AT)
	IN	Inhalation Rate	m3/hr	1 2	EPA, 1997	NA	EPA, 1997	
	ET	Exposure Time	hr/day	24	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	6	Age 1 through 6	NA	Age 3 through 4	
	BW	Body Weight	kg	16 6	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	NA	EPA, 1989	

Notes/Sources:
NA - Not Applicable
*These exposure parameters are also valid for Future/Subsurface Soil/Contact (Inhalation) with Particulates in Subsurface Soil at Site 09 - Newport, Rhode Island
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment 24 hours of exposure based on time at site
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response. Washington, DC
EPA, 1994 EPA Region I, Risk Updates August 1994, Volume II
EPA, 1996. Soil Screening Guidance, Users Guide Office of Emergency and Remedial Response EPA 540/R-96/018
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.21
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL ADULT CONTACT WITH SURFACE SOIL*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium. Surface Soil
Exposure Medium. Surface Soil
Exposure Point: Contact (via ingestion) with Surface Soil
Receptor Population Residential
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	EPA, 1997	NA	EPA, 1994	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997	NA	EPA, 1997	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	70	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	NA	EPA, 1989	

Notes/Sources
NA - Not Applicable
*These exposure parameters are also valid for Future/Subsurface Soil/Contact (via ingestion) with Subsurface Soil at Site 09 - Newport, Rhode Island.
Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment
(a). EPC = Calculated Exposure Point Concentration
(b). Professional Judgment Fraction ingested is 100% from source

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC.
EPA, 1994 EPA Region I, Risk Updates August 1994, Volume II
EPA, 1995 Assessing Dermal Exposure from Soil, EPA Region III Technical Guidance Manual, EPA/903-K-95-003 December
EPA, 1997 Exposure Factors Handbook. Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.22
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL ADULT CONTACT WITH SURFACE SOIL*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point Contact (via dermal absorption) with Surface Soil
Receptor Population Residential
Receptor Age. Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm2	7014	(b)	NA	(b)	CS x SA x SSAF x DABS x EV x EF x ED x CF3 x 1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2/event	0 08	EPA, 1997b	NA	EPA, 1997b	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	(c)	NA	(c)	
	EV	Event Frequency	events/day	1	(d)	NA	(d)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997a	NA	EPA, 1997a	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	70	EPA, 1997a	NA	EPA, 1997a	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	NA	EPA, 1989	

Notes/Sources.
NA - Not Applicable
*These exposure parameters are also valid for Future/Subsurface Soil/Contact (via dermal absorption) with Subsurface Soil at Site 09 - Newport, Rhode Island
Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment.
(a). EPC = Calculated Exposure Point Concentration
(b). Surface Area represented by hands, head, feet, forearms, and lower legs
(c) Various sources as provided by EPA Region I
(d) Professional Judgment 1 Event per day.

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC
EPA, 1994. EPA Region I, Risk Updates August 1994, Volume II
EPA, 1997a Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development
EPA, 1997b Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) Supplemental Guidance Dermal Risk Assessment (Interim Guidance) EPA Region I

TABLE 6-4.23
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RESIDENTIAL ADULT CONTACT WITH SURFACE SOIL*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium· Surface Soil
Exposure Medium. Particulates
Exposure Point Inhalation of Particulates in Surface Soil
Receptor Population Residential
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1 32E+09	EPA, 1996	NA	EPA, 1996	(CS/PEF) x IN x ET x EF x ED x 1/(BW x AT)
	IN	Inhalation Rate	m3/hr	1 6	EPA, 1997	NA	EPA, 1997	
	ET	Exposure Time	hr/day	24	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	240	EPA, 1994	NA	EPA, 1994	
	ED	Exposure Duration	years	24	EPA, 1997	NA	EPA, 1997	
	BW	Body Weight	kg	70	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	NA	EPA, 1989	

Notes/Sources
NA - Not Applicable
*These exposure parameters are also valid for Future/Subsurface Soil/Contact (Inhalation) with Particulates in Subsurface Soil at Site 09 - Newport, Rhode Island
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment 24 hours of exposure based on time at site
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response. Washington, DC.
EPA, 1994 EPA Region I, Risk Updates August 1994, Volume II.
EPA, 1996. Soil Screening Guidance, Users Guide Office of Emergency and Remedial Response EPA 540/R-96/018.
EPA, 1997 Exposure Factors Handbook. Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development.

TABLE 6-4.24
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE EXCAVATION WORKER CONTACT WITH SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point Contact (via ingestion) with Subsurface Soil
Receptor Population: Excavation Worker
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	EPA, 1994	NA	EPA, 1994	CS x IR-S x FI x EF x ED x CF1 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	156	(c)	NA	(e)	
	ED	Exposure Duration	years	1	(d)	NA	(d)	
	CF1	Conversion Factor 1	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	70	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	NA	EPA, 1989	

Notes/Sources
NA - Not Applicable
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment. Fraction ingested is 100% from source
(c) Professional Judgment 26 Weeks * 6 days per week = 156 days. Off and on throughout that year
(d) Professional Judgment. 1 Year of exposure
(e). Professional Judgment. 13 Weeks * 6 days per week = 78 days Off and on throughout that year

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002 Office of Emergency and Remedial Response.
EPA, 1994. EPA Region I, Risk Updates. August 1994, Volume II.
EPA, 1997. Exposure Factors Handbook. Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989. Office of Research and Development

TABLE 6-4.25
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE EXCAVATION WORKER CONTACT WITH SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium Subsurface Soil
Exposure Point Contact (via dermal absorption) with Subsurface Soil
Receptor Population. Excavation Worker
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Dermal Absorption	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Dermal Absorbed Dose (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm2	7014	(b)	NA	(b)	CS x SA x SSAF x DABS x EV x EF x ED x CF3 x 1/(BW x AT)
	SSAF	Soil-to-Skin Adherence Factor	mg/cm2/event	0 08	EPA, 1997b	NA	EPA, 1997b	
	DABS	Dermal Absorption Factor (Solid)	--	Chemical-Specific	EPA, 1995	NA	EPA, 1995	
	EV	Event Frequency	events/day	1	(c)	NA	(c)	
	EF	Exposure Frequency	days/year	156	(d)	NA	(f)	
	ED	Exposure Duration	years	1	(e)	NA	(e)	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	NA	--	
	BW	Body Weight	kg	70	EPA, 1997a	NA	EPA, 1997a	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	NA	EPA, 1989	

Notes/Sources
NA - Not Applicable
(a). EPC = Calculated Exposure Point Concentration.
(b). Surface Area represented by hands, head, feet, forearms, and lower legs
(c) Professional Judgement 1 Event per day
(d). Professional Judgment 26 Weeks * 6 days per week = 156 days Off and on throughout that year
(e). Professional Judgment. 1 Year of exposure
(f). Professional Judgment 13 Weeks * 6 days per week = 78 days Off and on throughout that year

EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002 Office of Emergency and Remedial Response.
EPA, 1995 Assessing Dermal Exposure from Soil, EPA Region III Technical Guidance Manual, EPA/903-K-95-003 December.
EPA, 1997a Exposure Factors Handbook. Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development.
EPA, 1997b Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Supplemental Guidance. Dermal Risk Assessment (Interim Guidance) EPA Region I.

TABLE 6-4.26
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE EXCAVATION WORKER CONTACT WITH SUBSURFACE SOIL
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium: Subsurface Soil
Exposure Medium Particulates
Exposure Point. Inhalation of Particulates in Subsurface Soil
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Inhalation	CS	Chemical Concentration in Soil	mg/kg	See EPC	(a)	NA	(a)	Intake (mg/kg-day) =
	PEF	Particulate Emission Factor from Soil	m3/kg	1.32E+09	EPA, 1996	NA	EPA, 1996	(CS/PEF) x IN x ET x EF x ED x 1/(BW x AT)
	IN	Inhalation Rate	m3/hr	3.3	EPA, 1997	NA	EPA, 1997	
	ET	Exposure Time	hr/day	8	(b)	NA	(b)	
	EF	Exposure Frequency	days/year	156	(c)	NA	(e)	
	ED	Exposure Duration	years	1	(d)	NA	(d)	
	BW	Body Weight	kg	70	EPA, 1997	NA	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	NA	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	365	EPA, 1989	NA	EPA, 1989	

Notes/Sources.
NA - Not Applicable
(a) EPC = Calculated Exposure Point Concentration
(b) Professional Judgment 8 Hours per day of exposure based on an average workday
(c). Professional Judgment 26 Weeks * 6 days per week = 156 days. Off and on throughout that year
(d) Professional Judgment. 1 Year of exposure
(e) Professional Judgment. 13 Weeks * 6 days per week = 78 days Off and on throughout that year
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response
EPA, 1996 Soil Screening Guidance Users Guide. EPA 9355 4-23 Office of Solid Waste and Emergency Response
EPA, 1997 Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-4.27
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RECREATIONAL CHILD CONTACT WITH CLAMS*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium: Clams
Exposure Medium Clams
Exposure Point Contact (via ingestion) with Clams
Receptor Population Recreational
Receptor Age Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Clams	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Clams	mg/day	396	(b)	396	(b)	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(c)	1	(c)	
	EF	Exposure Frequency	days/year	350	EPA, 1997	350	EPA, 1997	
	ED	Exposure Duration	years	6	Age 1 through 6	2	Age 3 through 4	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	16 6	EPA, 1997	16 6	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	2190	EPA, 1989	730	EPA, 1989	

Notes/Sources
*These exposure parameters are also valid for Future/Mussels/Mussels/Contact (via ingestion) with Mussels at Site 09 - Newport, Rhode Island
*These exposure parameters are also valid for Future/Lobsters/Lobsters/Contact (via ingestion) with Lobsters at Site 09 - Newport, Rhode Island
(a) EPC = Calculated Exposure Point Concentration.
(b) 48,000 mg seafood per serving * 2 9 servings per year * 1 year/350 days = 396 mg/day Source: Narragansett Bay Project NBP-92-105, Brown et al., Clark University, 1992
(c) Professional Judgment Fraction ingested is 100% from source
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC
EPA, 1997 Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989. Office of Research and Development

TABLE 6-4.28
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE RECREATIONAL ADULT CONTACT WITH CLAMS*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium: Clams
Exposure Medium Clams
Exposure Point Contact (via ingestion) with Clams
Receptor Population: Recreational
Receptor Age. Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Clams	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Clams	mg/day	1200	(b)	1200	(b)	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(c)	1	(c)	
	EF	Exposure Frequency	days/year	350	EPA, 1997	350	EPA, 1997	
	ED	Exposure Duration	years	24	EPA, 1997	9	EPA, 1997	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	3285	EPA, 1989	

Notes/Sources:

*These exposure parameters are also valid for Future/Mussels/Mussels/Contact (via ingestion) with Mussels at Site 09 - Newport, Rhode Island

*These exposure parameters are also valid for Future/Lobsters/Lobsters/Contact (via ingestion) with Lobsters at Site 09 - Newport, Rhode Island

(a). EPC = Calculated Exposure Point Concentration.

(b). 150,000 mg seafood per serving * 2.9 servings per year * 1 year/350 days = 1,200 mg/day. Source: Narragansett Bay Project. NBP-92-105, Brown et al , Clark University, 1992.

(c). Professional Judgment Fraction ingested is 100% from source

EPA, 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002 Office of Emergency and Remedial Response Washington, DC.

EPA, 1995. Assessing Dermal Exposure from Soil, EPA Region III Technical Guidance Manual, EPA/903-K-95-003. December

EPA, 1997 Exposure Factors Handbook Update to Exposure Factors Handbook EPA/600/8-89/043 - May 1989. Office of Research and Development.

TABLE 6-4.29
VALUES USED FOR DAILY INTAKE CALCULATIONS - RME AND CTE SUBSISTENT FISHERMAN CONTACT WITH CLAMS*
OLD FIRE FIGHTING TRAINING AREA
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium Clams
Exposure Medium: Clams
Exposure Point. Contact (via ingestion) with Clams
Receptor Population Subsistent Fisherman
Receptor Age Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	CS	Chemical Concentration in Clams	mg/kg	See EPC	(a)	See EPC	(a)	Intake (mg/kg-day) =
	IR-S	Ingestion Rate of Clams	mg/day	20000	(b)	20000	(b)	CS x IR-S x FI x EF x ED x CF3 x 1/(BW x AT)
	FI	Fraction Ingested From Contaminated Source	--	1	(c)	1	(c)	
	EF	Exposure Frequency	days/year	350	EPA, 1997	350	EPA, 1997	
	ED	Exposure Duration	years	24	EPA, 1997	9	EPA, 1997	
	CF3	Conversion Factor 3	kg/mg	1E-06	--	1E-06	--	
	BW	Body Weight	kg	70	EPA, 1997	70	EPA, 1997	
	AT-C	Averaging Time (Cancer)	days	25550	EPA, 1989	25550	EPA, 1989	
	AT-N	Averaging Time (Non-Cancer)	days	8760	EPA, 1989	3285	EPA, 1989	

Notes/Sources
*These exposure parameters are also valid for Future/Mussels/Mussels/Contact (via ingestion) with Mussels at Site 09 - Newport, Rhode Island
*These exposure parameters are also valid for Future/Lobsters/Lobsters/Contact (via ingestion) with Lobsters at Site 09 - Newport, Rhode Island
Lifetime exposures for future residents (child/adult) will be quantified indirectly, by adding child and adult cancer risks in the Risk Characterization section of this risk assessment
(a) EPC = Calculated Exposure Point Concentration.
(b). 150,000 mg seafood per serving * 2 9 servings per year * 1 year/350 days = 1,200 mg/day Source Narragansett Bay Project. NBP-92-105, Brown et.al , Clark University, 1992
(c) Professional Judgment Fraction ingested is 100% from source
EPA, 1989 Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A) EPA 540/1-89/002. Office of Emergency and Remedial Response Washington, DC
EPA, 1995 Assessing Dermal Exposure from Soil, EPA Region III Technical Guidance Manual, EPA/903-K-95-003 December
EPA, 1997. Exposure Factors Handbook Update to Exposure Factors Handbook. EPA/600/8-89/043 - May 1989 Office of Research and Development

TABLE 6-5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD Target Organ (3) (MM/DD/YY)	Dermal Absorption Factor for Soil
Total 2,3,7,8-TCDD Equiv	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 03
Antimony	Chronic	4 00E-04	mg/kg-day	1.50E-01	6 00E-05	mg/kg-day	Blood	1000	IRIS	09/12/00	N/A
Arsenic	Chronic	3 00E-04	mg/kg-day	1.00E+00	3 00E-04	mg/kg-day	Skin	3	IRIS	09/12/00	0 03
Boron	Chronic	9 00E-02	mg/kg-day	1.00E+00	9.00E-02	mg/kg-day	Reproductive	100	IRIS	09/12/00	N/A
Cadmium	Chronic	1.00E-03	mg/kg-day	5 00E-02	1 00E-03	mg/kg-day	Kidney	10	IRIS	09/12/00	0 001
Chromium	Chronic	3 00E-03	mg/kg-day	2 50E-02	7.50E-05	mg/kg-day	Kidney	900	IRIS	09/12/00	N/A
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese (Food)	Chronic	1 40E-01	mg/kg-day	6 00E-02	8 40E-03	mg/kg-day	CNS	1	IRIS	09/12/00	N/A
Manganese (Soil)	Chronic	7.20E-02	mg/kg-day	6 00E-02	4.32E-03	mg/kg-day	CNS	1	IRIS	09/12/00	N/A
Mercury	Chronic	1.00E-04	mg/kg-day	7 00E-02	7.00E-06	mg/kg-day	CNS	10	IRIS	09/12/00	N/A
Nickel	Chronic	2 00E-02	mg/kg-day	4.00E-02	8 00E-04	mg/kg-day	Decr Org Wt	300	IRIS	09/12/00	N/A
Selenium	Chronic	5.00E-03	mg/kg-day	1 00E+00	5 00E-03	mg/kg-day	Blood/Skin/CNS	3	IRIS	09/12/00	N/A
Silver		5 00E-03	mg/kg-day	4.00E-02	2 00E-04	mg/kg-day					N/A
Vanadium	Chronic	7 00E-03	mg/kg-day	2.60E-02	1 82E-04	mg/kg-day	NOAEL	100	HEAST	1997	N/A
Zinc	Chronic	3 00E-01	mg/kg-day	1.00E+00	3 00E-01	mg/kg-day	Blood	3	IRIS	09/12/00	N/A
2,4'-DDD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 03
2,4'-DDT	Chronic	5 00E-04	mg/kg-day	1.00E+00	5 00E-04	mg/kg-day	Liver	100	IRIS-surr	09/12/00	0.03
4,4'-DDD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 03
4,4'-DDE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 03
4,4'-DDT	Chronic	5.00E-04	mg/kg-day	1 00E+00	5 00E-04	mg/kg-day	Liver	100	IRIS	09/12/00	0.03
Alpha-Chlordane	Chronic	5 00E-04	mg/kg-day	1.00E+00	5 00E-04	mg/kg-day	Liver	300	IRIS	09/12/00	0 04
Aroclor-1254	Chronic	2.00E-05	mg/kg-day	1 00E+00	2 00E-05	mg/kg-day	Skin/Eye	300	IRIS	09/12/00	0 14
Delta-BHC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dieldrin	Chronic	5 00E-05	mg/kg-day	1.00E+00	5.00E-05	mg/kg-day	Liver	100	IRIS	09/12/00	N/A
Heptachlor Epoxide	Chronic	1 30E-05	mg/kg-day	1.00E+00	1.30E-05	mg/kg-day	Liver	1000	IRIS	09/12/00	N/A
Total PCB Congeners	Chronic	2 00E-05	mg/kg-day	1.00E+00	2 00E-05	mg/kg-day	Skin/Eye	300	IRIS	09/12/00	0 14
trans-Nonachlor*	Chronic	5.00E-04	mg/kg-day	1 00E+00	5 00E-04	mg/kg-day	Liver	300	IRIS	09/12/00	0 04
1-Methylphenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.13

TABLE 6-5.1 (c ntinued)
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)	Dermal Absorption Factor for Soil
2,3,5-Trimethylnaphthalen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.13
2,6-Dimethylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
4,6-Dinitro-2-methylpheno	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4-Chloro-3-methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Benz(a)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Benzo(b)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Benzo(e)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Benzo(k)fluoranthene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.13
Carbazole	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Chrysene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Dibenz(a,h)anthracene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Dibenzothiophene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
Perylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable
(1) Refer to RAGS, Part A Source: EPA, 1998a
(2) Adjusted RfD = oral RfD x GI absorption value in toxicity study upon which the RfD is based To be used for dermal pathway only.
(3) IRIS - Integrated Risk Information System (EPA, 2000)
HEAST - Health Effects Assessment Summary Tables (EPA, 1997)
*Values for trans-Nonachlor adopted from technical chlordane

TABLE 6-5.2
NON-CANCER TOXICITY DATA -- INHALATION
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Value nhalation RfC	Units	Adjusted Inhalation RfD	Units	Primary Target Organ	Combined ncertainty/Modifying Factors	Sources of RfC RfD arget Organ	Dates (1) (MM/DD/YY)
Total 2,3,7,8-TCDD Equiv	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Antimony	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Boron	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	Subchronic	---	---	2 86E-05	mg/kg-day	Lung	300	IRIS	09/12/00
Lead	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	---	---	1 43E-05	mg/kg-day	CNS	1000	IRIS	09/12/00
Mercury	Chronic	---	---	8 60E-05	mg/kg-day	CNS	30	IRIS	09/12/00
Nickel	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Selenium	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Vanadium	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
2,4'-DDD	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
2,4'-DDT	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDD	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDE	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
4,4'-DDT	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Alpha-Chlordane	Chronic	---	---	2 00E-04	mg/kg-day	Liver	1000	IRIS	09/12/00
Aroclor-1254	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Delta-BHC	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Dieldrin	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Heptachlor Epoxide	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Total PCB Congeners	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
trans-Nonachlor	Chronic	---	---	2.00E-04	mg/kg-day	Liver	1000	IRIS	09/12/00
1-Methylphenanthrene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
2,3,5-Trimethylnaphthaler	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 6-[illegible]continued)
NON-CANCER TOXICITY DATA -- INHALATION
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Chronic/ Subchronic	Value nhalation RfC	Units	Adjusted Inhalation RfD	Units	Primary Target Organ	Combined ncertainty/Modifying Factors	Sources of RfC RfD: arget Organ	Dates (1) (MM/DD/YY)
2,6-Dimethylnaphthalene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
4,6-Dinitro-2-methylpheno	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
4-Chloro-3-methylphenol	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Benz(a)anthracene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(b)fluoranthene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(e)pyrene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Carbazole	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Chrysene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Dibenzothiophene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A
Perylene	N/A	---	---	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable

(1) IRIS - Integrated Risk Information System (EPA, 2000)

TABLE 6-6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor(3)	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source Target Organ	Date (2) (MM/DD/YY)	Dermal Absorption Factor for Soil
Total 2,3,7,8-TCDD Equiv	1 50E+05	1 00E+00	1 50E+05	1/(mg/kg-day)	B2	HEAST	1997	0.03
Antimony	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Arsenic	1 50E+00	1 00E+00	1 50E+00	1/(mg/kg-day)	A	IRIS	09/12/00	0 03
Boron	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Cadmium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 001
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Lead	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Manganese	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Nickel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
2,4'-DDD	2.40E-01	1 00E+00	2 40E-01	1/(mg/kg-day)	B2	IRIS-surr	09/12/00	0.03
2,4'-DDT	3.40E-01	1 00E+00	3 40E-01	1/(mg/kg-day)	B2	IRIS-surr	09/12/00	0.03
4,4'-DDD	2 40E-01	1 00E+00	2 40E-01	1/(mg/kg-day)	B2	IRIS	09/12/00	0 03
4,4'-DDE	3 40E-01	1 00E+00	3 40E-01	1/(mg/kg-day)	B2	IRIS	09/12/00	0.03
4,4'-DDT	3 40E-01	1 00E+00	3 40E-01	1/(mg/kg-day)	B2	IRIS	09/12/00	0 03
Alpha-Chlordane	3 50E-01	1.00E+00	3 50E-01	1/(mg/kg-day)	B2	IRIS	09/12/00	0.04
Aroclor-1254	2 00E+00	1 00E+00	2.00E+00	1/(mg/kg-day)	B2	IRIS	09/12/00	0 14
Delta-BHC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Dieldrin	1 60E+01	1 00E+00	1 60E+01	1/(mg/kg-day)	B2	IRIS	09/12/00	0
Heptachlor Epoxide	9.10E+00	1.00E+00	9 10E+00	1/(mg/kg-day)	B2	IRIS	09/12/00	0
Total PCB Congeners	2 00E+00	1 00E+00	2 00E+00	1/(mg/kg-day)	B2	IRIS	09/12/00	0.14
trans-Nonachlor*	3 50E-01	1 00E+00	3 50E-01	1/(mg/kg-day)	B2	IRIS	09/12/00	0 04

TABLE [illegible]1 (continu d)
CANCER TOXICITY DATA -- ORAL/DERMAL
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (3)	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source Target Organ	Date (2) (MM/DD/YY)	Dermal Absorption Factor for Soil
1-Methylphenanthrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
2,3,5-Trimethylnaphthaler	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.13
2,6-Dimethylnaphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0 13
4,6-Dinitro-2-methylpheno	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
4-Chloro-3-methylphenol	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Benz(a)anthracene	7.30E-01	1 00E+00	7 30E-01	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00	0 13
Benzo(a)pyrene	7 30E+00	1 00E+00	7.30E+00	1/(mg/kg-day)	B2	IRIS	09/12/00	0 13
Benzo(b)fluoranthene	7 30E-01	1 00E+00	7 30E-01	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00	0 13
Benzo(e)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.13
Benzo(k)fluoranthene	7.30E-02	1.00E+00	7 30E-02	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00	0.13
Carbazole	2 00E-02	1 00E+00	2 00E-02	1/(mg/kg-day)	B2	HEAST	1997	0 13
Chrysene	7 30E-03	1 00E+00	7 30E-03	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00	0 13
Dibenz(a,h)anthracene	7 30E+00	1 00E+00	7 30E+00	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00	0 13
Dibenzothiophene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Indeno(1,2,3-cd)pyrene	7.30E-01	1.00E+00	7.30E-01	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00	0.13
Perylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables

Weight of Evidence:
- Known/Likely
- Cannot be Determined
- Not Likely

EPA Group
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

(1) Adjusted SF dermal = oral SF/GI absorption value in toxicity study upon which the SF is based. To be used for dermal pathway only
(2) IRIS - Integrated Risk Information System (EPA, 2000)
HEAST - Health Effects Assessment Summary Tables (EPA, 1997)
(3) EPA, 1998a
*Values for trans-Nonachlor adopted from technical chlordane

TABLE 6-6.2
CANCER TOXICITY DATA -- INHALATION
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Chemical of Potential Concern	Unit Risk	Units	Adjustment	halation Cance Slope Factor	Units	eight of Evidence Cancer Guideline Description	Source	Date (1) MM/DD/YY)
Total 2,3,7,8-TCDD Equiv	---	---	---	1.50E+05	1/(mg/kg-day)	B2	HEAST	03/10/99
Antimony	---	---	---	N/A	N/A	N/A	N/A	N/A
Arsenic	---	---	---	1.51E+01	1/(mg/kg-day)	A	09/12/00	02/23/99
Boron	---	---	---	N/A	N/A	N/A	N/A	N/A
Cadmium	---	---	---	6.30E+00	1/(mg/kg-day)	B1	IRIS	09/12/00
Chromium	---	---	---	4.10E+01	1/(mg/kg-day)	A	IRIS	09/12/00
Lead	---	---	---	N/A	N/A	N/A	N/A	N/A
Manganese	---	---	---	N/A	N/A	N/A	N/A	N/A
Mercury	---	---	---	N/A	N/A	N/A	N/A	N/A
Nickel	---	---	---	N/A	N/A	N/A	N/A	N/A
Selenium	---	---	---	N/A	N/A	N/A	N/A	N/A
Silver	---	---	---	N/A	N/A	N/A	N/A	N/A
Vanadium	---	---	---	N/A	N/A	N/A	N/A	N/A
Zinc	---	---	---	N/A	N/A	N/A	N/A	N/A
2,4'-DDD	---	---	---	N/A	N/A	N/A	N/A	N/A
2,4'-DDT	---	---	---	3.40E-01	1/(mg/kg-day)	B2	IRIS-surr.	09/12/00
4,4'-DDD	---	---	---	N/A	N/A	N/A	N/A	N/A
4,4'-DDE	---	---	---	N/A	N/A	N/A	N/A	N/A
4,4'-DDT	---	---	---	3.40E-01	1/(mg/kg-day)	B2	IRIS	09/12/00
Alpha-Chlordane	---	---	---	3.50E-01	1/(mg/kg-day)	B2	IRIS	09/12/00
Aroclor-1254	---	---	---	2.00E+00	1/(mg/kg-day)	B2	IRIS	09/12/00
Delta-BHC	---	---	---	N/A	N/A	N/A	N/A	N/A
Dieldrin	---	---	---	1.60E+01	1/(mg/kg-day)	B2	IRIS	09/12/00
Heptachlor Epoxide	---	---	---	9.10E+00	1/(mg/kg-day)	B2	IRIS	09/12/00
Total PCB Congeners	---	---	---	2.00E+00	1/(mg/kg-day)	B2	IRIS	09/12/00

TABLE 6-6.2 (continued)
CANCER TOXICITY DATA -- INHALATION
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND
PAGE 2 OF 2

Chemical of Potential Concern	Unit Risk	Units	Adjustment	halation Cance Slope Factor	Units	eight of Evidence Cancer Guideline Description	Source	Date (1) MM/DD/YY)
trans-Nonachlor	---	---	---	3.50E-01	1/(mg/kg-day)	B2	IRIS	09/12/00
1-Methylphenanthrene	---	---	---	N/A	N/A	N/A	N/A	N/A
2,3,5-Trimethylnaphthale	---	---	---	N/A	N/A	N/A	N/A	N/A
2,6-Dimethylnaphthalene	---	---	---	N/A	N/A	N/A	N/A	N/A
4,6-Dinitro-2-methylphen	---	---	---	N/A	N/A	N/A	N/A	N/A
4-Chloro-3-methylpheno	---	---	---	N/A	N/A	N/A	N/A	N/A
Benz(a)anthracene	---	---	---	N/A	N/A	N/A	N/A	N/A
Benzo(a)pyrene	---	---	---	3.10E+00	1/(mg/kg-day)	B2	EPA-NCEA	09/12/00
Benzo(b)fluoranthene	---	---	---	N/A	N/A	N/A	N/A	N/A
Benzo(e)pyrene	---	---	---	N/A	N/A	N/A	N/A	N/A
Benzo(k)fluoranthene	---	---	---	N/A	N/A	N/A	N/A	N/A
Carbazole	---	---	---	N/A	N/A	N/A	N/A	N/A
Chrysene	---	---	---	N/A	N/A	N/A	N/A	N/A
Dibenz(a,h)anthracene	---	---	---	N/A	N/A	N/A	N/A	N/A
Dibenzothiophene	---	---	---	N/A	N/A	N/A	N/A	N/A
Indeno(1,2,3-cd)pyrene	---	---	---	N/A	N/A	N/A	N/A	N/A
Perylene	---	---	---	N/A	N/A	N/A	N/A	N/A

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables

Weight of Evidence:
- Known/Likely
- Cannot be Determined
- Not Likely

EPA Group:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

(1) IRIS - Integrated Risk Information System (EPA, 2000)
HEAST - Health Effects Assessment Summary Tables (EPA, 1997)

TABLE 6-7.1
CALCULATION OF NON-CANCER HAZARDS - CHILD RESIDENT CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	9 51E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	5 04E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 68E-01
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 13E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	3 78E-02
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	3 94E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	2 30E-03	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	3 19E-02
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 38E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	6 89E-03
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 94E-07	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	1 47E-02
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 11E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	4 43E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	4 38E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	5 06E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 67E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 52E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	4 22E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 86E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 92E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 59E-01
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	8 96E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	4 75E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 58E-02
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	8 00E-04	mg/kg-day	N/A	N/A	NA
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 29E-07	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	6 47E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 81E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 79E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 07E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 09E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 03E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 73E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 17E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 19E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 23E-02
												Total of Routes	2 82E-01

TABLE 6-7.2
CALCULATION OF NON-CANCER HAZARDS - CHILD RESIDENT PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 04E-14	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	5 50E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 24E-08	mg/kg-day	--	--	2 86E-05	mg/kg-day	4 32E-04
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	4 30E-08	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	2 51E-07	mg/kg-day	--	--	1 43E-05	mg/kg-day	1 75E-02
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 50E-08	mg/kg-day	--	--	--	mg/kg-day	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 21E-11	mg/kg-day	--	--	--	mg/kg-day	--
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 21E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	4 83E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	4 78E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	5 52E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 91E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 75E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	4 61E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	3 12E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	3 18E-10	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												1 80E-02

TABLE 6-7.3
CALCULATION OF NON-CANCER HAZARDS - ADULT RESIDENT CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 13E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	5 97E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 99E-02
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 34E-05	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	4 48E-03
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	4 67E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	2 72E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	3 78E-03
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 63E-05	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	8 17E-04
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 48E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	1 74E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 32E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	5 25E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	5 19E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	6 00E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	3 17E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 99E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	5 01E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	3 39E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	3 46E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												3 07E-02
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 90E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 01E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	3 35E-03
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	8 00E-04	mg/kg-day	N/A	N/A	NA
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 74E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	1 37E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	3 83E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	3 79E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	4 38E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 31E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 18E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	3 65E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 47E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 52E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												4 72E-03
												Total of Routes	3 55E-02

TABLE 6-7.4
CALCULATION OF NON-CANCER HAZARDS - ADULT RESIDENT PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	3 28E-15	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 74E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	3 91E-09	mg/kg-day	--	--	2 86E-05	mg/kg-day	1 37E-04
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 36E-08	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	7 92E-08	mg/kg-day	--	--	1 43E-05	mg/kg-day	5 54E-03
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	4 75E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 01E-11	mg/kg-day	--	--	--	mg/kg-day	--
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	3 83E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 53E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 51E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 75E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	9 21E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	8 69E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 46E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	9 86E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 01E-10	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												5 68E-03

TABLE 6-7.5
CALCULATION OF NON-CANCER HAZARDS - CHILD (AGE 1-4) RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Child (Age 1-4)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	2 21E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 17E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	3 90E-02
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	2 63E-05	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	8 77E-03
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	9 14E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	5 33E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	7 41E-03
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	3 20E-05	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	1 60E-03
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	6 82E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	3 41E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	2 57E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 03E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 02E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 18E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	6 20E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	5 85E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	9 80E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	6 64E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	6 77E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												6 02E-02
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 91E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 01E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	3 37E-03
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	8 00E-04	mg/kg-day	N/A	N/A	NA
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 76E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	1 38E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	3 86E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	3 81E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	4 41E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 32E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 19E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	3 68E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 49E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 54E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												4 75E-03
												Total of Routes	6 49E-02

TABLE 6-7.6
CALCULATION OF NON-CANCER HAZARDS - CHILD (AGE 1-4) RECREATIONAL PERSON PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population Recreational Person
Receptor Age Child (Age 1-4)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	5 02E-16	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	2 66E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	5 98E-10	mg/kg-day	--	--	2 86E-05	mg/kg-day	2 09E-05
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	2 08E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	1 21E-08	mg/kg-day	--	--	1 43E-05	mg/kg-day	8 48E-04
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	7 27E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 55E-12	mg/kg-day	--	--	--	mg/kg-day	--
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	5 85E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	2 34E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	2 31E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 67E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 41E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 33E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	2 23E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 51E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 54E-11	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												8 69E-04

TABLE 6-7.7
CALCULATION OF NON-CANCER HAZARDS - YOUTH (AGE 5-12) RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Youth (Age 5-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	5 93E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	3 14E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 05E-02
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	7 06E-06	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	2 35E-03
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	2 45E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	1 43E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	1 99E-03
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	8 59E-06	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	4 30E-04
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 83E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	9 16E-04
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	6 92E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	2 76E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	2 73E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	3 16E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 66E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 57E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	2 63E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 78E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 82E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												1 62E-02
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	2 14E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 14E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	3 79E-03
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	8 00E-04	mg/kg-day	N/A	N/A	NA
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 09E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	1 55E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	4 33E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	4 28E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	4 95E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 61E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 46E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	4 13E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 79E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 85E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												5 33E-03
												Total of Routes	2 15E-02

TABLE 6-7.8
CALCULATION OF NON-CANCER HAZARDS - YOUTH (AGE 5-12) RECREATIONAL PERSON PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population Recreational Person
Receptor Age Youth (Age 5-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	3 59E-16	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 90E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 28E-10	mg/kg-day	--	--	2 86E-05	mg/kg-day	1 50E-05
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 49E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	8 68E-09	mg/kg-day	--	--	1 43E-05	mg/kg-day	6 07E-04
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5 21E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 11E-12	mg/kg-day	--	--	--	mg/kg-day	--
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	4 19E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 67E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 66E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 91E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 01E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	9 52E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 60E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 08E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 10E-11	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												6 22E-04

TABLE 6-7.9
CALCULATION OF NON-CANCER HAZARDS - ADULT RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 35E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	7 17E-07	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 39E-03
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 61E-06	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	5 37E-04
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	5 60E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	3 27E-05	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	4 54E-04
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 96E-06	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	9 81E-05
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	4 18E-09	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	2 09E-04
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 58E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	6 30E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	6 23E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	7 20E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	3 80E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	3 58E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	6 01E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	4 07E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	4 15E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												3 69E-03
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	3 79E-13	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	2 01E-07	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	6 70E-04
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	8 00E-04	mg/kg-day	N/A	N/A	NA
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	5 48E-09	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	2 74E-04
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	7 66E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	7 58E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	8 76E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	4 62E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	4 36E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	7 30E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	4 95E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	5 04E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												9 44E-04
												Total of Routes	4 63E-03

TABLE 6-7.10
CALCULATION OF NON-CANCER HAZARDS - ADULT RECREATIONAL PERSON PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 37E-16	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	7 24E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 63E-10	mg/kg-day	--	--	2 86E-05	mg/kg-day	5 69E-06
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	5 66E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	3 30E-09	mg/kg-day	--	--	1 43E-05	mg/kg-day	2 31E-04
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 98E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	4 22E-13	mg/kg-day	--	--	--	mg/kg-day	--
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 59E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	6 36E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	6 30E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	7 28E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	3 84E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	3 62E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	6 07E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	4 11E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	4 19E-12	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												2 37E-04

TABLE 6-7.11
CALCULATION OF NON-CANCER HAZARDS - ADULT EXCAVATION WORKER CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	3 52E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 86E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	6 21E-02
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 19E-05	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 40E-02
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 46E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	8 50E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	1 18E-02
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5 10E-05	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	2 55E-03
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 09E-07	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	5 44E-03
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	4 10E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 64E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 62E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 87E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	9 88E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	9 32E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 56E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 06E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 08E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												9 59E-02
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 23E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	6 54E-07	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 18E-03
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	8 00E-04	mg/kg-day	N/A	N/A	NA
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 78E-08	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	8 90E-04
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	2 49E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	2 46E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 85E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 50E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 42E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	2 37E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 61E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 64E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												3 07E-03
												Total of Routes	9 90E-02

TABLE 6-7.12
CALCULATION OF NON-CANCER HAZARDS - ADULT EXCAVATION WORKER PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 47E-15	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	7 77E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 75E-09	mg/kg-day	--	--	2 86E-05	mg/kg-day	6 1056751467710E-05
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	6 07E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	3 54E-08	mg/kg-day	--	--	1 43E-05	mg/kg-day	2 4764276819071E-03
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	2 12E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	4 53E-12	mg/kg-day	--	--	--	mg/kg-day	--
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 71E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	6 83E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	6 75E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	7 80E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	4 12E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	3 88E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	6 51E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	4 41E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	4 49E-11	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												2 5374844333748E-03

TABLE 6-7.13
CALCULATION OF NON-CANCER HAZARDS - CHILD RESIDENT CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point Contact with Subsurface Soils
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	7 19E-05	mg/kg-day	4 00E-04	mg/kg-day	N/A	N/A	1 80E-01
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	8 00E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 67E-01
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	1 24E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	4 12E-02
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	4 02E-03	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	3 78E-03	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	5 25E-02
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	2 69E-06	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	2 69E-02
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	1 55E-04	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	2 22E-02
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	4 82E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	1 61E-02
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	1 33E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	5 52E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 10E-03
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	2 54E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	9 74E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	9 59E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	8 56E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	5 58E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	1 74E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	9 98E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	4 06E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	6 81E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												6 07E-01
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	6 00E-05	mg/kg-day	N/A	N/A	NA
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	7 54E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 51E-02
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	7 00E-06	mg/kg-day	N/A	N/A	NA
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	1 82E-04	mg/kg-day	N/A	N/A	NA
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	NA
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	NA
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	3 98E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	3 92E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	3 50E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	2 28E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	7 12E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	4 08E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	1 66E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	2 78E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												2 51E-02
												Total of Routes	6 32E-01

TABLE 6-7.14
CALCULATION OF NON-CANCER HAZARDS - CHILD RESIDENT PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Subsurface Soils
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	7 85E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	8 73E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	1 35E-08	mg/kg-day	--	--	2 86E-05	mg/kg-day	4 71E-04
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	4 38E-07	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	4 12E-07	mg/kg-day	--	--	1 43E-05	mg/kg-day	2 88E-02
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	2 94E-10	mg/kg-day	--	--	8 60E-05	mg/kg-day	3 42E-06
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	1 69E-08	mg/kg-day	--	--	--	mg/kg-day	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	5 26E-07	mg/kg-day	--	--	--	mg/kg-day	--
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	1 45E-12	mg/kg-day	--	--	--	mg/kg-day	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	6 02E-12	mg/kg-day	--	--	--	mg/kg-day	--
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	2 77E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	1 06E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	1 05E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	9 33E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	6 08E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	1 90E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	1 09E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	4 43E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	7 43E-10	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												2 93E-02

TABLE 6-7.15
CALCULATION OF NON-CANCER HAZARDS - ADULT RESIDENT CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point Contact with Subsurface Soils
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	8 53E-06	mg/kg-day	4 00E-04	mg/kg-day	N/A	N/A	2 13E-02
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	9 49E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	3 16E-02
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	1 47E-05	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	4 88E-03
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	4 76E-04	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	4 48E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	6 22E-03
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	3 19E-07	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	3 19E-03
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	1 84E-05	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	2 63E-03
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	5 72E-04	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	1 91E-03
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	1 58E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	6 55E-09	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 31E-04
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	3 01E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	1 16E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	1 14E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	1 01E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	6 61E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	2 07E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	1 18E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	4 82E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	8 08E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												7 19E-02
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	6 00E-05	mg/kg-day	N/A	N/A	NA
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	1 60E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	5 32E-03
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	7 00E-06	mg/kg-day	N/A	N/A	NA
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	1 82E-04	mg/kg-day	N/A	N/A	NA
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	NA
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	NA
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	8 43E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	8 29E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	7 40E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	4 82E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	1 51E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	8 63E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	3 52E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	5 89E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												5 32E-03
												Total of Routes	7 72E-02

TABLE 6-7.16
CALCULATION OF NON-CANCER HAZARDS - ADULT RESIDENT PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Subsurface Soils
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Antimony	9.08E+00	mg/kg	9.08E+00	mg/kg	M	2.48E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	1.01E+01	mg/kg	1.01E+01	mg/kg	M	2.76E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1.56E+01	mg/kg	1.56E+01	mg/kg	M	4.26E-09	mg/kg-day	--	--	2.86E-05	mg/kg-day	1.49E-04
	Lead	5.07E+02	mg/kg	5.07E+02	mg/kg	M	1.39E-07	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	4.77E+02	mg/kg	4.77E+02	mg/kg	M	1.30E-07	mg/kg-day	--	--	1.43E-05	mg/kg-day	9.12E-03
	Mercury	3.40E-01	mg/kg	3.40E-01	mg/kg	M	9.29E-11	mg/kg-day	--	--	8.60E-05	mg/kg-day	1.08E-06
	Vanadium	1.96E+01	mg/kg	1.96E+01	mg/kg	M	5.36E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Zinc	6.09E+02	mg/kg	6.09E+02	mg/kg	M	1.66E-07	mg/kg-day	--	--	--	mg/kg-day	--
	Delta-BHC	1.68E+00	ug/kg	1.68E+00	ug/kg	M	4.59E-13	mg/kg-day	--	--	--	mg/kg-day	--
	Dieldrin	6.97E+00	ug/kg	6.97E+00	ug/kg	M	1.90E-12	mg/kg-day	--	--	--	mg/kg-day	--
	4,6-Dinitro-2-methylphenol	3.20E+02	ug/kg	3.20E+02	ug/kg	M	8.74E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	1.23E+03	ug/kg	1.23E+03	ug/kg	M	3.36E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	1.21E+03	ug/kg	1.21E+03	ug/kg	M	3.31E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	1.08E+03	ug/kg	1.08E+03	ug/kg	M	2.95E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	7.04E+02	ug/kg	7.04E+02	ug/kg	M	1.92E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	2.20E+02	ug/kg	2.20E+02	ug/kg	M	6.01E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	1.26E+03	ug/kg	1.26E+03	ug/kg	M	3.44E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	5.13E+02	ug/kg	5.13E+02	ug/kg	M	1.40E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	8.60E+02	ug/kg	8.60E+02	ug/kg	M	2.35E-10	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												9.27E-03

TABLE 6-7.17
CALCULATION OF NON-CANCER HAZARDS - ADULT EXCAVATION WORKER CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point Contact with Subsurface Soils
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	2 66E-05	mg/kg-day	4 00E-04	mg/kg-day	N/A	N/A	6 65E-02
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	2 96E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	9 87E-02
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	4 57E-05	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 52E-02
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	1 49E-03	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	1 40E-03	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	1 94E-02
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	9 96E-07	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	9 96E-03
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	5 74E-05	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	8 21E-03
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	1 78E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	5 95E-03
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	4 92E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	2 04E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	4 09E-04
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	9 38E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	3 60E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	3 55E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	3 17E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	2 06E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	6 45E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	3 69E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	1 50E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	2 52E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 24E-01
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	6 00E-05	mg/kg-day	N/A	N/A	NA
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	1 04E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	3 46E-03
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	7 50E-05	mg/kg-day	N/A	N/A	NA
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	7 00E-06	mg/kg-day	N/A	N/A	NA
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	1 82E-04	mg/kg-day	N/A	N/A	NA
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	NA
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	NA
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	5 48E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	5 39E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	4 81E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	3 14E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	9 80E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	5 61E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	2 28E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	3 83E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												3 46E-03
												Total of Routes	2 28E-01

TABLE 6-7.18
CALCULATION OF NON-CANCER HAZARDS - ADULT EXCAVATION WORKER PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Subsurface Soils
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	1 11E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	1 23E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	1 90E-09	mg/kg-day	--	--	2 86E-05	mg/kg-day	6 66E-05
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	6 19E-08	mg/kg-day	--	--	--	mg/kg-day	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	5 82E-08	mg/kg-day	--	--	1 43E-05	mg/kg-day	4 07E-03
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	4 15E-11	mg/kg-day	--	--	8 60E-05	mg/kg-day	4 83E-07
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	2 39E-09	mg/kg-day	--	--	--	mg/kg-day	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	7 44E-08	mg/kg-day	--	--	--	mg/kg-day	--
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	2 05E-13	mg/kg-day	--	--	--	mg/kg-day	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	8 51E-13	mg/kg-day	--	--	--	mg/kg-day	--
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	3 91E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	1 50E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	1 48E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	1 32E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	8 60E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	2 69E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	1 54E-10	mg/kg-day	--	--	--	mg/kg-day	--
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	6 26E-11	mg/kg-day	--	--	--	mg/kg-day	--
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	1 05E-10	mg/kg-day	--	--	--	mg/kg-day	--
	(Total)												4 14E-03

TABLE 6-7.19
CALCULATION OF NON-CANCER HAZARDS - CHILD RESIDENT CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Sediment
Exposure Medium Sediment
Exposure Point Contact with Sediment
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	2 59E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	8 62E-02
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	4 91E-03	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	6 82E-02
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	7 53E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	5 55E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	6 73E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	2 85E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	6 73E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	1 15E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	3 96E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												1 54E-01
Dermal	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	2 93E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	9 76E-03
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	3 69E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	2 72E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	3 30E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	1 40E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	3 30E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	5 64E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1 94E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												9 76E-03
												Total of Routes	1 64E-01

TABLE 6-7.20
CALCULATION OF NON-CANCER HAZARDS - ADULT RESIDENT CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Sediment
Exposure Medium Sediment
Exposure Point Contact with Sediment
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	3 07E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 02E-02
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	5 82E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	8 09E-03
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	8 92E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	6 58E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	7 98E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	3 38E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	7 98E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	1 36E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	4 70E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												1 83E-02
Dermal	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	1 57E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	5 22E-03
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	1 98E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	1 46E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	1 77E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	7 49E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	1 77E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	3 02E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1 04E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												5 22E-03
												Total of Routes	2 35E-02

TABLE 6-7.21
CALCULATION OF NON-CANCER HAZARDS - CHILD (AGE 1-4) SHORELINE VISITOR CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Sediment
Exposure Medium Sediment
Exposure Point Contact with Sediment
Receptor Population Shoreline Visitor
Receptor Age Child (Age 1-4)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	1 50E-06	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	5 00E-03
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	2 85E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	3 96E-03
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	4 37E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	3 22E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	3 91E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	1 66E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	3 91E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	6 67E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	2 30E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												8 96E-03
Dermal	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	1 57E-07	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	5 22E-04
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	1 97E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	1 45E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	1 77E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	7 48E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	1 77E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	3 01E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1 04E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												5 22E-04
												Total of Routes	9 49E-03

TABLE 6-7.22

CALCULATION OF NON-CANCER HAZARDS - YOUTH (AGE 5-12) SHORELINE VISITOR CONTACT WITH SEDIMENT

REASONABLE MAXIMUM EXPOSURE

FINAL REMEDIAL INVESTIGATION

NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Sediment
Exposure Medium Sediment
Exposure Point Contact with Sediment
Receptor Population Shoreline Visitor
Receptor Age Youth (Age 5-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	8 26E-07	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 75E-03
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	1 57E-04	mg/kg-day	7 20E-02	mg/kg-day	N/A	N/A	2 18E-03
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	2 40E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	1 77E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2 15E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	9 10E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2 15E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	3 67E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1 26E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												4 93E-03
Dermal	Arsenic	6 53E+00	mg/kg	6 53E+00	mg/kg	M	2 27E-07	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	7 56E-04
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	NA	mg/kg-day	4 32E-03	mg/kg-day	N/A	N/A	NA
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	2 86E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	2 11E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2 56E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	1 08E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2 56E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2 90E+02	ug/kg	M	4 36E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1 50E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												7 56E-04
												Total of Routes	5 69E-03

TABLE 6-7.23
CALCULATION OF NON-CANCER HAZARDS - ADULT SUBSISTENCE FISHERMAN INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Lobster
Exposure Medium Animal Tissue
Exposure Point Ingestion of Lobster
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	8 55E+00	mg/kg	8 55E+00	mg/kg	M	2 34E-03	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	7 81E+00
	Cadmium	1 27E+01	mg/kg	1 27E+01	mg/kg	M	3 48E-03	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	3 48E+00
	Chromium	1 71E+01	mg/kg	1 71E+01	mg/kg	M	4 68E-03	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 56E+00
	Lead	1 59E+01	mg/kg	1 59E+01	mg/kg	M	4 36E-03	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Mercury	3 53E+00	mg/kg	3 53E+00	mg/kg	M	9 67E-04	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	9 67E+00
	Nickel	3 90E+01	mg/kg	3 90E+01	mg/kg	M	1 07E-02	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	5 34E-01
	Silver	3 50E+00	mg/kg	3 50E+00	mg/kg	M	9 59E-04	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 92E-01
	Zinc	2 73E+02	mg/kg	2 73E+02	mg/kg	M	7 48E-02	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	2 49E-01
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	1 14E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	6 26E-01	ug/kg	6 26E-01	ug/kg	M	1 72E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	3 43E-04
	4,4'-DDD	1 04E+00	ug/kg	1 04E+00	ug/kg	M	2 85E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	1 30E+01	ug/kg	1 30E+01	ug/kg	M	3 56E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDT	4 18E-01	ug/kg	4 18E-01	ug/kg	M	1 15E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 29E-04
	Dieldrin	4 47E+00	ug/kg	4 47E+00	ug/kg	M	1 22E-06	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	2 45E-02
	Total PCB Congeners	2 65E+02	ug/kg	2 65E+02	ug/kg	M	7 26E-05	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	3 63E+00
	1-Methylphenanthrene	3 14E+00	ug/kg	3 14E+00	ug/kg	M	8 60E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 97E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2 00E+00	ug/kg	M	5 48E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	9 46E+01	ug/kg	9 46E+01	ug/kg	M	2 59E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	4 71E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 87E+02	ug/kg	1 87E+02	ug/kg	M	5 12E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	4 97E+01	ug/kg	4 97E+01	ug/kg	M	1 36E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	8 91E+01	ug/kg	8 91E+01	ug/kg	M	2 44E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 18E+02	ug/kg	1 18E+02	ug/kg	M	3 23E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 74E+00	ug/kg	3 74E+00	ug/kg	M	1 02E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 01E+02	ug/kg	1 01E+02	ug/kg	M	2 77E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 85E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 72E+01
												Total of Routes	2 72E+01

TABLE 6-7.24
CALCULATION OF NON-CANCER HAZARDS - CHILD RECREATIONAL PERSON INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Lobster
Exposure Medium Animal Tissue
Exposure Point Ingestion of Lobster
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	8 55E+00	mg/kg	8 55E+00	mg/kg	M	1 96E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	6 52E-01
	Cadmium	1 27E+01	mg/kg	1 27E+01	mg/kg	M	2 91E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	2 91E-01
	Chromium	1 71E+01	mg/kg	1 71E+01	mg/kg	M	3 91E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 30E-01
	Lead	1 59E+01	mg/kg	1 59E+01	mg/kg	M	3 64E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Mercury	3 53E+00	mg/kg	3 53E+00	mg/kg	M	8 07E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	8 07E-01
	Nickel	3 90E+01	mg/kg	3 90E+01	mg/kg	M	8 92E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	4 46E-02
	Silver	3 50E+00	mg/kg	3 50E+00	mg/kg	M	8 01E-05	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 60E-02
	Zinc	2 73E+02	mg/kg	2 73E+02	mg/kg	M	6 24E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	2 08E-02
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	9 54E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	6 26E-01	ug/kg	6 26E-01	ug/kg	M	1 43E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 86E-05
	4,4'-DDD	1 04E+00	ug/kg	1 04E+00	ug/kg	M	2 38E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	1 30E+01	ug/kg	1 30E+01	ug/kg	M	2 97E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDT	4 18E-01	ug/kg	4 18E-01	ug/kg	M	9 56E-09	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 91E-05
	Dieldrin	4 47E+00	ug/kg	4 47E+00	ug/kg	M	1 02E-07	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	2 05E-03
	Total PCB Congeners	2 65E+02	ug/kg	2 65E+02	ug/kg	M	6 06E-06	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	3 03E-01
	1-Methylphenanthrene	3 14E+00	ug/kg	3 14E+00	ug/kg	M	7 18E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 32E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2 00E+00	ug/kg	M	4 58E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	9 46E+01	ug/kg	9 46E+01	ug/kg	M	2 16E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	3 93E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 87E+02	ug/kg	1 87E+02	ug/kg	M	4 28E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	4 97E+01	ug/kg	4 97E+01	ug/kg	M	1 14E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	8 91E+01	ug/kg	8 91E+01	ug/kg	M	2 04E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 18E+02	ug/kg	1 18E+02	ug/kg	M	2 70E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 74E+00	ug/kg	3 74E+00	ug/kg	M	8 56E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 01E+02	ug/kg	1 01E+02	ug/kg	M	2 31E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 38E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 27E+00
												Total of Routes	2 27E+00

TABLE 6-7.25
CALCULATION OF NON-CANCER HAZARDS - ADULT RECREATIONAL PERSON INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Lobster
Exposure Medium Animal Tissue
Exposure Point Ingestion of Lobster
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	8 55E+00	mg/kg	8 55E+00	mg/kg	M	1 41E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	4 68E-01
	Cadmium	1 27E+01	mg/kg	1 27E+01	mg/kg	M	2 09E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	2 09E-01
	Chromium	1 71E+01	mg/kg	1 71E+01	mg/kg	M	2 81E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	9 37E-02
	Lead	1 59E+01	mg/kg	1 59E+01	mg/kg	M	2 61E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Mercury	3 53E+00	mg/kg	3 53E+00	mg/kg	M	5 80E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	5 80E-01
	Nickel	3 90E+01	mg/kg	3 90E+01	mg/kg	M	6 41E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	3 21E-02
	Silver	3 50E+00	mg/kg	3 50E+00	mg/kg	M	5 75E-05	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 15E-02
	Zinc	2 73E+02	mg/kg	2 73E+02	mg/kg	M	4 49E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	1 50E-02
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	6 85E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	6 26E-01	ug/kg	6 26E-01	ug/kg	M	1 03E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 06E-05
	4,4'-DDD	1 04E+00	ug/kg	1 04E+00	ug/kg	M	1 71E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	1 30E+01	ug/kg	1 30E+01	ug/kg	M	2 14E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDT	4 18E-01	ug/kg	4 18E-01	ug/kg	M	6 87E-09	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 37E-05
	Dieldrin	4 47E+00	ug/kg	4 47E+00	ug/kg	M	7 35E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 47E-03
	Total PCB Congeners	2 65E+02	ug/kg	2 65E+02	ug/kg	M	4 36E-06	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	2 18E-01
	1-Methylphenanthrene	3 14E+00	ug/kg	3 14E+00	ug/kg	M	5 16E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	2 38E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2 00E+00	ug/kg	M	3 29E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	9 46E+01	ug/kg	9 46E+01	ug/kg	M	1 56E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	2 83E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 87E+02	ug/kg	1 87E+02	ug/kg	M	3 07E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	4 97E+01	ug/kg	4 97E+01	ug/kg	M	8 17E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	8 91E+01	ug/kg	8 91E+01	ug/kg	M	1 46E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 18E+02	ug/kg	1 18E+02	ug/kg	M	1 94E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 74E+00	ug/kg	3 74E+00	ug/kg	M	6 15E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 01E+02	ug/kg	1 01E+02	ug/kg	M	1 66E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	1 71E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												1 63E+00
												Total of Routes	1 63E+00

TABLE 6-7.26
CALCULATION OF NON-CANCER HAZARDS - ADULT SUBSISTENCE FISHERMAN INGESTION OF LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Lobster
Exposure Medium Animal Tissue
Exposure Point Ingestion of Lobster
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	8 55E+00	mg/kg	8 55E+00	mg/kg	M	2 34E-03	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	7 81E+00
	Cadmium	1 27E+01	mg/kg	1 27E+01	mg/kg	M	3 48E-03	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	3 48E+00
	Chromium	1 71E+01	mg/kg	1 71E+01	mg/kg	M	4 68E-03	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 56E+00
	Lead	1 59E+01	mg/kg	1 59E+01	mg/kg	M	4 36E-03	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Mercury	3 53E+00	mg/kg	3 53E+00	mg/kg	M	9 67E-04	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	9 67E+00
	Nickel	3 90E+01	mg/kg	3 90E+01	mg/kg	M	1 07E-02	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	5 34E-01
	Silver	3 50E+00	mg/kg	3 50E+00	mg/kg	M	9 59E-04	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 92E-01
	Zinc	2 73E+02	mg/kg	2 73E+02	mg/kg	M	7 48E-02	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	2 49E-01
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	1 14E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	6 26E-01	ug/kg	6 26E-01	ug/kg	M	1 72E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	3 43E-04
	4,4'-DDD	1 04E+00	ug/kg	1 04E+00	ug/kg	M	2 85E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	1 30E+01	ug/kg	1 30E+01	ug/kg	M	3 56E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDT	4 18E-01	ug/kg	4 18E-01	ug/kg	M	1 15E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 29E-04
	Dieldrin	4 47E+00	ug/kg	4 47E+00	ug/kg	M	1 22E-06	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	2 45E-02
	Total PCB Congeners	2 65E+02	ug/kg	2 65E+02	ug/kg	M	7 26E-05	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	3 63E+00
	1-Methylphenanthrene	3 14E+00	ug/kg	3 14E+00	ug/kg	M	8 60E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 97E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2 00E+00	ug/kg	M	5 48E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	9 46E+01	ug/kg	9 46E+01	ug/kg	M	2 59E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	4 71E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 87E+02	ug/kg	1 87E+02	ug/kg	M	5 12E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	4 97E+01	ug/kg	4 97E+01	ug/kg	M	1 36E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	8 91E+01	ug/kg	8 91E+01	ug/kg	M	2 44E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 18E+02	ug/kg	1 18E+02	ug/kg	M	3 23E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	3 74E+00	ug/kg	3 74E+00	ug/kg	M	1 02E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	1 01E+02	ug/kg	1 01E+02	ug/kg	M	2 77E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	5 49E+00	ug/kg	5 49E+00	ug/kg	M	1 50E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 72E+01
												Total of Routes	2 72E+01

TABLE 6-7.27
CALCULATION OF NON-CANCER HAZARDS - ADULT SUBSISTENCE FISHERMAN INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point. Ingestion of Clams
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	3 18E-03	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 06E+01
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	8 71E-03	mg/kg-day	9 00E-02	mg/kg-day	N/A	N/A	9 68E-02
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	2 10E-03	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	2 10E+00
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	2 04E-02	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	6 79E+00
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 49E-03	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	9 28E+01	mg/kg	9 28E+01	mg/kg	M	2 54E-02	mg/kg-day	1 40E-01	mg/kg-day	N/A	N/A	1 82E-01
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	7 81E-04	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	7 81E+00
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	6 16E-03	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	3 08E-01
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	4 05E-04	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	8 11E-02
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	1 19E-04	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	2 39E-02
	Vanadium	3 73E+00	mg/kg	3 73E+00	mg/kg	M	1 02E-03	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	1 46E-01
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	2 49E-02	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	8 31E-02
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	4 03E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	6 14E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 23E-03
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	6 55E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	1 15E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	9 78E-07	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 96E-02
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	1 02E-04	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	5 11E+00
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	9 10E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	3 29E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	6 14E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	4 05E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	2 59E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	4 14E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	4 66E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 85E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	5 26E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 97E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenzothiophene	2 63E+00	ug/kg	2 63E+00	ug/kg	M	7 21E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	2 64E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	7 62E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												3 33E+01
												Total of Routes	3 33E+01

TABLE 6-7.28
CALCULATION OF NON-CANCER HAZARDS - CHILD RECREATIONAL PERSON INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	2 65E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	8 85E-01
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	7 27E-04	mg/kg-day	9 00E-02	mg/kg-day	N/A	N/A	8 08E-03
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	1 75E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	1 75E-01
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	1 70E-03	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	5 67E-01
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 25E-04	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	9 28E+01	mg/kg	9 28E+01	mg/kg	M	2 12E-03	mg/kg-day	1 40E-01	mg/kg-day	N/A	N/A	1 52E-02
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	6 52E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	6 52E-01
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	5 15E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	2 57E-02
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	3 39E-05	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	6 77E-03
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	9 97E-06	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 99E-03
	Vanadium	3 73E+00	mg/kg	3 73E+00	mg/kg	M	8 53E-05	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	1 22E-02
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	2 08E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	6 94E-03
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	3 36E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	5 12E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 02E-04
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	5 47E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	9 58E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	8 17E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 63E-03
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	8 53E-06	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	4 27E-01
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	7 59E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	2 75E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	5 12E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	3 39E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	2 16E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	3 45E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	3 89E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 38E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	4 39E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 32E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenzothiophene	2 63E+00	ug/kg	2 63E+00	ug/kg	M	6 02E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	2 21E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	6 36E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												2 78E+00
												Total of Routes	2 78E+00

TABLE 6-7.29
CALCULATION OF NON-CANCER HAZARDS - ADULT RECREATIONAL PERSON INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point. Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	1 91E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	6 36E-01
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	5 23E-04	mg/kg-day	9 00E-02	mg/kg-day	N/A	N/A	5 81E-03
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	1 26E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	1 26E-01
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	1 22E-03	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	4 08E-01
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	8 96E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	9 28E+01	mg/kg	9 28E+01	mg/kg	M	1 53E-03	mg/kg-day	1 40E-01	mg/kg-day	N/A	N/A	1 09E-02
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	4 68E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	4 68E-01
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	3 70E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	1 85E-02
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	2 43E-05	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	4 87E-03
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	7 17E-06	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 43E-03
	Vanadium	3 73E+00	mg/kg	3 73E+00	mg/kg	M	6 13E-05	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	8 76E-03
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	1 50E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	4 99E-03
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	2 42E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	3 68E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	7 36E-05
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	3 93E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	6 89E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	5 87E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 17E-03
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	6 13E-06	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	3 07E-01
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	5 46E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	1 97E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	3 68E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	2 43E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	1 55E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	2 48E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	2 79E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	1 71E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	3 16E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	2 38E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenzothiophene	2 63E+00	ug/kg	2 63E+00	ug/kg	M	4 32E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	1 59E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	4 57E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												2 00E+00
												Total of Routes	2 00E+00

TABLE 6-7.30
CALCULATION OF NON-CANCER HAZARDS - ADULT SUBSISTENCE FISHERMAN INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	3 18E-03	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 06E+01
	Boron	2 69E+01	mg/kg	2 69E+01	mg/kg	M	7 37E-03	mg/kg-day	9 00E-02	mg/kg-day	N/A	N/A	8 19E-02
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	2 10E-03	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	2 10E+00
	Chromium	1 46E+01	mg/kg	1 46E+01	mg/kg	M	4 00E-03	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 33E+00
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 49E-03	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	4 09E+01	mg/kg	4 09E+01	mg/kg	M	1 12E-02	mg/kg-day	1 40E-01	mg/kg-day	N/A	N/A	8 00E-02
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	7 81E-04	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	7 81E+00
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	6 16E-03	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	3 08E-01
	Selenium	8 43E-01	mg/kg	8 43E-01	mg/kg	M	2 31E-04	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	4 62E-02
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	1 19E-04	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	2 39E-02
	Vanadium	2 52E+00	mg/kg	2 52E+00	mg/kg	M	6 90E-04	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	9 86E-02
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	2 49E-02	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	8 31E-02
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	4 03E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	6 14E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 23E-03
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	6 55E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	1 15E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	9 78E-07	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 96E-02
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	1 02E-04	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	5 11E+00
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	9 10E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	3 29E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	6 14E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	4 05E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	2 59E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	4 14E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	4 66E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 85E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	5 26E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 97E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenzothiophene	1 90E+00	ug/kg	1 90E+00	ug/kg	M	5 21E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	2 64E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	7 62E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												2 77E+01
												Total of Routes	2 77E+01

TABLE 6-7.31
CALCULATION OF NON-CANCER HAZARDS - CHILD RECREATIONAL PERSON INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	2 65E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	8 85E-01
	Boron	2 69E+01	mg/kg	2 69E+01	mg/kg	M	6 15E-04	mg/kg-day	9 00E-02	mg/kg-day	N/A	N/A	6 84E-03
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	1 75E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	1 75E-01
	Chromium	1 46E+01	mg/kg	1 46E+01	mg/kg	M	3 34E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 11E-01
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 25E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Manganese	4 09E+01	mg/kg	4 09E+01	mg/kg	M	9 36E-04	mg/kg-day	1 40E-01	mg/kg-day	N/A	N/A	6 68E-03
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	6 52E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	6 52E-01
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	5 15E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	2 57E-02
	Selenium	8 43E-01	mg/kg	8 43E-01	mg/kg	M	1 93E-05	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	3 86E-03
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	9 97E-06	mg/kg-day	5 00E-03	mg/kg-day	N/A	N/A	1 99E-03
	Vanadium	2 52E+00	mg/kg	2 52E+00	mg/kg	M	5 76E-05	mg/kg-day	7 00E-03	mg/kg-day	N/A	N/A	8 24E-03
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	2 08E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	6 94E-03
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	3 36E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	5 12E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 02E-04
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	5 47E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	9 58E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	8 17E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 63E-03
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	8 53E-06	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	4 27E-01
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	7 59E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	2 75E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	5 12E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	3 39E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	2 16E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	3 45E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	3 89E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 38E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	4 39E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 32E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenzothiophene	1 90E+00	ug/kg	1 90E+00	ug/kg	M	4 35E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	2 21E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	6 36E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 31E+00
												Total of Routes	2 31E+00

TABLE 6-7.32
CALCULATION OF NON-CANCER HAZARDS - ADULT RECREATIONAL PERSON INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium: Clams
Exposure Medium: Animal Tissue
Exposure Point: Ingestion of Clams
Receptor Population: Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	1.16E+01	mg/kg	1.16E+01	mg/kg	M	1.91E-04	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.36E-01
	Boron	2.69E+01	mg/kg	2.69E+01	mg/kg	M	4.42E-04	mg/kg-day	9.00E-02	mg/kg-day	N/A	N/A	4.91E-03
	Cadmium	7.66E+00	mg/kg	7.66E+00	mg/kg	M	1.26E-04	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.26E-01
	Chromium	1.46E+01	mg/kg	1.46E+01	mg/kg	M	2.40E-04	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	8.00E-02
	Lead	5.45E+00	mg/kg	5.45E+00	mg/kg	M	8.96E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Manganese	4.09E+01	mg/kg	4.09E+01	mg/kg	M	6.72E-04	mg/kg-day	1.40E-01	mg/kg-day	N/A	N/A	4.80E-03
	Mercury	2.85E+00	mg/kg	2.85E+00	mg/kg	M	4.68E-05	mg/kg-day	1.00E-04	mg/kg-day	N/A	N/A	4.68E-01
	Nickel	2.25E+01	mg/kg	2.25E+01	mg/kg	M	3.70E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.85E-02
	Selenium	8.43E-01	mg/kg	8.43E-01	mg/kg	M	1.39E-05	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.77E-03
	Silver	4.36E-01	mg/kg	4.36E-01	mg/kg	M	7.17E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.43E-03
	Vanadium	2.52E+00	mg/kg	2.52E+00	mg/kg	M	4.14E-05	mg/kg-day	7.00E-03	mg/kg-day	N/A	N/A	5.92E-03
	Zinc	9.10E+01	mg/kg	9.10E+01	mg/kg	M	1.50E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.99E-03
	2,4'-DDD	1.47E+01	ug/kg	1.47E+01	ug/kg	M	2.42E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,4'-DDT	2.24E+00	ug/kg	2.24E+00	ug/kg	M	3.68E-08	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	7.36E-05
	4,4'-DDD	2.39E+00	ug/kg	2.39E+00	ug/kg	M	3.93E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDE	4.19E+00	ug/kg	4.19E+00	ug/kg	M	6.89E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dieldrin	3.57E+00	ug/kg	3.57E+00	ug/kg	M	5.87E-08	mg/kg-day	5.00E-05	mg/kg-day	N/A	N/A	1.17E-03
	Total PCB Congeners	3.73E+02	ug/kg	3.73E+02	ug/kg	M	6.13E-06	mg/kg-day	2.00E-05	mg/kg-day	N/A	N/A	3.07E-01
	1-Methylphenanthrene	3.32E+00	ug/kg	3.32E+00	ug/kg	M	5.46E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,3,5-Trimethylnaphthalene	1.20E+00	ug/kg	1.20E+00	ug/kg	M	1.97E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,6-Dimethylnaphthalene	2.24E+00	ug/kg	2.24E+00	ug/kg	M	3.68E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1.48E+01	ug/kg	1.48E+01	ug/kg	M	2.43E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	9.44E+00	ug/kg	9.44E+00	ug/kg	M	1.55E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1.51E+01	ug/kg	1.51E+01	ug/kg	M	2.48E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(e)pyrene	1.70E+01	ug/kg	1.70E+01	ug/kg	M	2.79E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	1.04E+01	ug/kg	1.04E+01	ug/kg	M	1.71E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	1.92E+01	ug/kg	1.92E+01	ug/kg	M	3.16E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	1.45E+00	ug/kg	1.45E+00	ug/kg	M	2.38E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenzothiophene	1.90E+00	ug/kg	1.90E+00	ug/kg	M	3.12E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	9.65E+00	ug/kg	9.65E+00	ug/kg	M	1.59E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Perylene	2.78E+00	ug/kg	2.78E+00	ug/kg	M	4.57E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												1.66E+00
												Total of Routes	1.66E+00

TABLE 6-7.33
CALCULATION OF NON-CANCER HAZARDS - ADULT SUBSISTENCE FISHERMAN INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point. Ingestion of Blue Mussels
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	6 27E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 09E+00
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	4 19E-03	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	4 19E+00
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	1 11E-02	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	3 70E+00
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	1 27E-03	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	7 45E-04	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	7 45E+00
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	2 93E-03	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	1 47E-01
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	4 11E-02	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	1 37E-01
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	9 62E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	7 37E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 47E-03
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	2 48E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	4 96E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	1 29E-06	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 58E-03
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	1 35E-06	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 70E-03
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	1 58E-06	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	3 16E-02
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	1 31E-07	mg/kg-day	1 30E-05	mg/kg-day	N/A	N/A	1 01E-02
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	1 35E-04	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	6 74E+00
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	1 12E-06	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 24E-03
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	1 38E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	1 01E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	1 67E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	4 36E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	2 62E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	5 15E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	9 48E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	5 40E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	1 01E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	4 22E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	2 66E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	3 62E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												2 45E+01
												Total of Routes	2 45E+01

TABLE 6-7.34
CALCULATION OF NON-CANCER HAZARDS - CHILD RECREATIONAL PERSON INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	5 24E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 75E-01
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	3 50E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	3 50E-01
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	9 26E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	3 09E-01
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	1 06E-04	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	6 22E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	6 22E-01
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	2 45E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	1 22E-02
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	3 43E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	1 14E-02
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	8 03E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	6 15E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 23E-04
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	2 07E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	4 14E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	1 08E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 15E-04
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	1 13E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 26E-04
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	1 32E-07	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	2 64E-03
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	1 09E-08	mg/kg-day	1 30E-05	mg/kg-day	N/A	N/A	8 41E-04
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	1 13E-05	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	5 63E-01
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	9 36E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 87E-04
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	1 15E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	8 46E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	1 40E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	3 64E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	2 18E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	4 30E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	7 91E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	4 51E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	8 42E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	3 52E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	2 22E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	3 02E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	–
	(Total)												2 05E+00
												Total of Routes	2 05E+00

TABLE 6-7.35
CALCULATION OF NON-CANCER HAZARDS - ADULT RECREATIONAL PERSON INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	3 76E-05	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	1 25E-01
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	2 52E-04	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	2 52E-01
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	6 66E-04	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	2 22E-01
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	7 59E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	4 47E-05	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	4 47E-01
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	1 76E-04	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	8 79E-03
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	2 47E-03	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	8 22E-03
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	5 77E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	4 42E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	8 84E-05
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	1 49E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	2 98E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	7 73E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 55E-04
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	8 10E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 62E-04
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	9 48E-08	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	1 90E-03
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	7 86E-09	mg/kg-day	1 30E-05	mg/kg-day	N/A	N/A	6 04E-04
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	8 09E-06	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	4 04E-01
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	6 72E-08	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 34E-04
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	8 27E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	6 08E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	1 00E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	2 61E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	1 57E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	3 09E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	5 69E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	3 24E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	6 05E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	2 53E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	1 60E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	2 17E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												1 47E+00
												Total of Routes	1 47E+00

TABLE 6-7.36
CALCULATION OF NON-CANCER HAZARDS - ADULT SUBSISTENCE FISHERMAN INGESTION OF BLUE MUSSELS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point. Ingestion of Blue Mussels
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	6 27E-04	mg/kg-day	3 00E-04	mg/kg-day	N/A	N/A	2 09E+00
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	4 19E-03	mg/kg-day	1 00E-03	mg/kg-day	N/A	N/A	4 19E+00
	Chromium	1 24E+01	mg/kg	1 24E+01	mg/kg	M	3 40E-03	mg/kg-day	3 00E-03	mg/kg-day	N/A	N/A	1 13E+00
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	1 27E-03	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	7 45E-04	mg/kg-day	1 00E-04	mg/kg-day	N/A	N/A	7 45E+00
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	2 93E-03	mg/kg-day	2 00E-02	mg/kg-day	N/A	N/A	1 47E-01
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	4 11E-02	mg/kg-day	3 00E-01	mg/kg-day	N/A	N/A	1 37E-01
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	9 62E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	7 37E-07	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	1 47E-03
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	2 48E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	4 96E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	1 29E-06	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 58E-03
	Alpha-Chlordane	3 94E+00	ug/kg	3 94E+00	ug/kg	M	1 08E-06	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 16E-03
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	1 58E-06	mg/kg-day	5 00E-05	mg/kg-day	N/A	N/A	3 16E-02
	Heptachlor Epoxide	2 23E-01	ug/kg	2 23E-01	ug/kg	M	6 11E-08	mg/kg-day	1 30E-05	mg/kg-day	N/A	N/A	4 70E-03
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	1 35E-04	mg/kg-day	2 00E-05	mg/kg-day	N/A	N/A	6 74E+00
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	1 12E-06	mg/kg-day	5 00E-04	mg/kg-day	N/A	N/A	2 24E-03
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	1 38E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	1 01E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	1 67E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	4 36E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	2 62E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	5 15E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	9 48E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	5 40E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	1 01E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	4 22E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	2 66E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	3 62E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	--
	(Total)												2 19E+01
												Total of Routes	2 19E+01

TABLE 6-8.1
CALCULATION OF CANCER RISKS - LIFETIME RESIDENT CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Resident
Receptor Age Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 20E-11	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 80E-06
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	6 37E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	9 55E-06
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 61E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 60E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	9 34E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5 60E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 71E-08	mg/kg-day	2 00E+00	1/(mg/kg-day)	7 43E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	4 51E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	5 60E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 09E-07
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	5 54E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	4 04E-06
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	6 40E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 67E-07
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	3 37E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 46E-08
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	3 18E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	6 37E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	5 34E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	3 90E-09
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	3 61E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 64E-06
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	3 68E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 69E-07
	(Total)										1 93E-05
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 42E-12	mg/kg-day	1 50E+05	1/(mg/kg-day)	2 13E-07
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	7 52E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 13E-06
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 05E-08	mg/kg-day	2 00E+00	1/(mg/kg-day)	4 09E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	2 86E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 09E-07
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	2 83E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 07E-06
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	3 27E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 39E-07
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 73E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 26E-08
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 63E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	3 26E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	2 73E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 99E-09
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 85E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 35E-06
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 89E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 38E-07
	(Total)										5 40E-06
										Total of Routes	2 47E-05

TABLE 6-8.2
CALCULATION OF CANCER RISKS - LIFETIME RESIDENT PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium· Surface Soils
Exposure Medium: Particulates
Exposure Point· Particulate Dust Inhalation from Surface Soils
Receptor Population Resident
Receptor Age· Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1.20E-02	ug/kg	M	2 01E-15	mg/kg-day	1.50E+05	1/(mg/kg-day)	3.02E-10
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 07E-09	mg/kg-day	1 51E+01	1/(mg/kg-day)	1 61E-08
	Chromium	1 43E+01	mg/kg	1.43E+01	mg/kg	M	2.40E-09	mg/kg-day	4.10E+01	1/(mg/kg-day)	9 84E-08
	Lead	4.97E+01	mg/kg	4.97E+01	mg/kg	M	4.66E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2.90E+02	mg/kg	M	2 72E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1.74E+01	mg/kg	M	1 63E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3.71E+01	ug/kg	M	6.22E-12	mg/kg-day	2.00E+00	1/(mg/kg-day)	1 24E-11
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 31E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5.59E+02	ug/kg	M	5.24E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5.53E+02	ug/kg	M	9 28E-11	mg/kg-day	3.10E+00	1/(mg/kg-day)	2 88E-10
	Benzo(b)fluoranthene	6.39E+02	ug/kg	6.39E+02	ug/kg	M	5 99E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3.37E+02	ug/kg	M	3.16E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3 18E+02	ug/kg	3.18E+02	ug/kg	M	2 98E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5 33E+02	ug/kg	5.33E+02	ug/kg	M	4.99E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3.61E+02	ug/kg	3.61E+02	ug/kg	M	3.38E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3.68E+02	ug/kg	3.68E+02	ug/kg	M	3 45E-11	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1.15E-07

TABLE 6-8.3
CALCULATION OF CANCER RISKS - CHILD RESIDENT CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	8 15E-12	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 22E-06
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	4 32E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	6 48E-06
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	9 71E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	3 37E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	1 97E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 18E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 52E-08	mg/kg-day	2 00E+00	1/(mg/kg-day)	5 04E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	9 51E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	3 80E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 77E-07
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	3 76E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 74E-06
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	4 34E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 17E-07
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 29E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 67E-08
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 16E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	4 32E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	3 62E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 64E-09
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 45E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 79E-06
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 50E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 82E-07
	(Total)										1 31E-05
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	7 68E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 15E-07
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	4 07E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	6 11E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 11E-08	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 22E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 55E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 13E-07
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 53E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 12E-06
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 77E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 29E-07
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	9 35E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	6 83E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	8 82E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 76E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 48E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 08E-09
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 00E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	7 31E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 02E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 45E-08
	(Total)										2 93E-06
										Total of Routes	1 60E-05

TABLE 6-8.4
CALCULATION OF CANCER RISKS - CHILD RESIDENT PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium: Surface Soils
Exposure Medium Particulates
Exposure Point. Particulate Dust Inhalation from Surface Soils
Receptor Population: Resident
Receptor Age. Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv	1.20E-02	ug/kg	1.20E-02	ug/kg	M	8.89E-16	mg/kg-day	1.50E+05	1/(mg/kg-day)	1.33E-10
	Arsenic	6.36E+00	mg/kg	6.36E+00	mg/kg	M	4.71E-10	mg/kg-day	1.51E+01	1/(mg/kg-day)	7.11E-09
	Chromium	1.43E+01	mg/kg	1.43E+01	mg/kg	M	1.06E-09	mg/kg-day	4.10E+01	1/(mg/kg-day)	4.34E-08
	Lead	4.97E+01	mg/kg	4.97E+01	mg/kg	M	3.68E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2.90E+02	mg/kg	2.90E+02	mg/kg	M	2.15E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1.74E+01	mg/kg	1.74E+01	mg/kg	M	1.29E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3.71E+01	ug/kg	3.71E+01	ug/kg	M	2.75E-12	mg/kg-day	2.00E+00	1/(mg/kg-day)	5.50E-12
	4-Chloro-3-methylphenol	1.40E+02	ug/kg	1.40E+02	ug/kg	M	1.04E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5.59E+02	ug/kg	5.59E+02	ug/kg	M	4.14E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5.53E+02	ug/kg	5.53E+02	ug/kg	M	4.10E-11	mg/kg-day	3.10E+00	1/(mg/kg-day)	1.27E-10
	Benzo(b)fluoranthene	6.39E+02	ug/kg	6.39E+02	ug/kg	M	4.73E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3.37E+02	ug/kg	3.37E+02	ug/kg	M	2.50E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3.18E+02	ug/kg	3.18E+02	ug/kg	M	2.36E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5.33E+02	ug/kg	5.33E+02	ug/kg	M	3.95E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3.61E+02	ug/kg	3.61E+02	ug/kg	M	2.67E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3.68E+02	ug/kg	3.68E+02	ug/kg	M	2.73E-11	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										5.08E-08

TABLE 6-8.5
CALCULATION OF CANCER RISKS - ADULT RESIDENT CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	3 86E-12	mg/kg-day	1 50E+05	1/(mg/kg-day)	5 80E-07
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	2 05E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	3 07E-06
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 61E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 60E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	9 34E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5 60E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 19E-08	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 39E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	4 51E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 80E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 31E-07
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 78E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 30E-06
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 06E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 50E-07
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 09E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	7 92E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 02E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 05E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 72E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 25E-09
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 16E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	8 49E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 19E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	8 65E-08
	(Total)										6 20E-06
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	6 51E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	9 76E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	3 45E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	5 17E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	9 39E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 88E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 31E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	9 59E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 30E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	9 48E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 50E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 10E-07
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	7 92E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	5 78E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	7 47E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 49E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 25E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	9 14E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	8 48E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 19E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	8 65E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 31E-08
	(Total)										2 48E-06
										Total of Routes	8 68E-06

TABLE 6-8.6
CALCULATION OF CANCER RISKS - ADULT RESIDENT PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium: Surface Soils
Exposure Medium: Particulates
Exposure Point. Particulate Dust Inhalation from Surface Soils
Receptor Population: Resident
Receptor Age. Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv.	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 12E-15	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 69E-10
	Arsenic	6 36E+00	mg/kg	6.36E+00	mg/kg	M	5 96E-10	mg/kg-day	1 51E+01	1/(mg/kg-day)	9.00E-09
	Chromium	1.43E+01	mg/kg	1.43E+01	mg/kg	M	1 34E-09	mg/kg-day	4 10E+01	1/(mg/kg-day)	5.49E-08
	Lead	4.97E+01	mg/kg	4.97E+01	mg/kg	M	4 66E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2.90E+02	mg/kg	M	2.72E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 63E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 48E-12	mg/kg-day	2.00E+00	1/(mg/kg-day)	6.95E-12
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1.40E+02	ug/kg	M	1 31E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5.59E+02	ug/kg	5 59E+02	ug/kg	M	5 24E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5.53E+02	ug/kg	5.53E+02	ug/kg	M	5.18E-11	mg/kg-day	3.10E+00	1/(mg/kg-day)	1.61E-10
	Benzo(b)fluoranthene	6.39E+02	ug/kg	6.39E+02	ug/kg	M	5.99E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3.37E+02	ug/kg	M	3 16E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3.18E+02	ug/kg	3 18E+02	ug/kg	M	2 98E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5.33E+02	ug/kg	5.33E+02	ug/kg	M	4 99E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3.61E+02	ug/kg	3.61E+02	ug/kg	M	3.38E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3.68E+02	ug/kg	3.68E+02	ug/kg	M	3.45E-11	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										6.43E-08

TABLE 6-8.7
CALCULATION OF CANCER RISKS - LIFETIME RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point: Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Youth (Age 1-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	2 29E-12	mg/kg-day	1 50E+05	1/(mg/kg-day)	3 43E-07
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 21E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 82E-06
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 14E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 44E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	8 41E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5 04E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	7 07E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 41E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	4 06E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 07E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 78E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 05E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	7 69E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 22E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	8 89E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	6 42E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	4 69E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	6 06E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 21E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 02E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	7 41E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	6 88E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	5 02E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	7 01E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	5 12E-08
	(Total)										3 67E-06
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	4 52E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	6 78E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	2 39E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	3 59E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	6 52E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 30E-08
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	9 12E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 66E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	9 02E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 58E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 04E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 61E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	5 50E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	4 01E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	5 19E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 04E-09
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	8 69E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	6 35E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	5 89E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	4 30E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	6 00E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 38E-08
	(Total)										1 72E-06
										Total of Routes	5 39E-06

TABLE 6-8.8
CALCULATION OF CANCER RISKS - RECREATIONAL YOUTH (AGE 1-12) PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium· Particulates
Exposure Point: Particulate Dust Inhalation from Surface Soils
Receptor Population: Recreational Person
Receptor Age. Youth (Age 1-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv.	1.20E-02	ug/kg	1 20E-02	ug/kg	M	1 05E-16	mg/kg-day	1.50E+05	1/(mg/kg-day)	1.57E-11
	Arsenic	6.36E+00	mg/kg	6 36E+00	mg/kg	M	5.56E-11	mg/kg-day	1 51E+01	1/(mg/kg-day)	8.39E-10
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 25E-10	mg/kg-day	4.10E+01	1/(mg/kg-day)	5 12E-09
	Lead	4.97E+01	mg/kg	4 97E+01	mg/kg	M	1.46E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2.90E+02	mg/kg	2 90E+02	mg/kg	M	8 49E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1.74E+01	mg/kg	1.74E+01	mg/kg	M	5.09E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3.71E+01	ug/kg	M	3 24E-13	mg/kg-day	2 00E+00	1/(mg/kg-day)	6 48E-13
	4-Chloro-3-methylphenol	1.40E+02	ug/kg	1.40E+02	ug/kg	M	4 10E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1.64E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	4.83E-12	mg/kg-day	3.10E+00	1/(mg/kg-day)	1.50E-11
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 87E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	9.87E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3.18E+02	ug/kg	3.18E+02	ug/kg	M	9.31E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1.56E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3.61E+02	ug/kg	3 61E+02	ug/kg	M	1.06E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3.68E+02	ug/kg	M	1.08E-12	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										5.99E-09

TABLE 6-8.9
CALCULATION OF CANCER RISKS - CHILD (AGE 1-4) RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Child (Age 1-4)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 26E-12	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 89E-07
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	6 68E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 00E-06
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	1 50E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	5 22E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	3 05E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	1 83E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 90E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	7 80E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	1 47E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	5 88E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 29E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	5 81E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	4 24E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	6 72E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 90E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	3 54E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 59E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	3 34E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	6 68E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	5 60E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	4 09E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	3 79E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 77E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	3 87E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 82E-08
	(Total)										2 02E-06
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 09E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 64E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	5 79E-08	mg/kg-day	1 50E+00	1/(mg/kg-day)	8 68E-08
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 57E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	3 15E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	2 20E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 61E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	2 18E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 59E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 52E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 84E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 33E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	9 70E-10
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 25E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 51E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	2 10E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 53E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 42E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 04E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 45E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 06E-08
	(Total)										4 16E-07
										Total of Routes	2 44E-06

TABLE 6-8.10
CALCULATION OF CANCER RISKS - CHILD (AGE 1-4) RECREATIONAL PERSON PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium. Surface Soils
Exposure Medium· Particulates
Exposure Point Particulate Dust Inhalation from Surface Soils
Receptor Population· Recreational Person
Receptor Age: Child (Age 1-4)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv.	1.20E-02	ug/kg	1.20E-02	ug/kg	M	2 87E-17	mg/kg-day	1.50E+05	1/(mg/kg-day)	4.30E-12
	Arsenic	6.36E+00	mg/kg	6.36E+00	mg/kg	M	1.52E-11	mg/kg-day	1.51E+01	1/(mg/kg-day)	2.29E-10
	Chromium	1 43E+01	mg/kg	1.43E+01	mg/kg	M	3 42E-11	mg/kg-day	4.10E+01	1/(mg/kg-day)	1.40E-09
	Lead	4.97E+01	mg/kg	4 97E+01	mg/kg	M	1 19E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2.90E+02	mg/kg	2.90E+02	mg/kg	M	6.93E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1.74E+01	mg/kg	1.74E+01	mg/kg	M	4.16E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	8 86E-14	mg/kg-day	2.00E+00	1/(mg/kg-day)	1.77E-13
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1.40E+02	ug/kg	M	3.34E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5.59E+02	ug/kg	M	1 34E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 32E-12	mg/kg-day	3 10E+00	1/(mg/kg-day)	4.09E-12
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 53E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	8.05E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	7 60E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5.33E+02	ug/kg	5 33E+02	ug/kg	M	1.27E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3.61E+02	ug/kg	M	8 62E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	8 79E-13	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 64E-09

TABLE 6-8.11
CALCULATION OF CANCER RISKS - YOUTH (AGE 5-12) RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Youth (Age 5-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	6 77E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 02E-07
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	3 59E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	5 39E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	8 07E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	2 81E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	1 64E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	9 82E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 09E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	4 19E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	7 90E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	3 16E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 30E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	3 12E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 28E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	3 61E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 63E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 90E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 39E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 80E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	3 59E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	3 01E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 20E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 04E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 49E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 08E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 52E-08
	(Total)										1 09E-06
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	2 45E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	3 67E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 30E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 95E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	3 53E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	7 07E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	4 94E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 61E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	4 89E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 57E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	5 65E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 13E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 98E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 18E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 81E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	5 63E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	4 71E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	3 44E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	3 19E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 33E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	3 26E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 38E-08
	(Total)										9 33E-07
										Total of Routes	2 02E-06

TABLE 6-8.12
CALCULATION OF CANCER RISKS - YOUTH (AGE 5-12) RECREATIONAL PERSON PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface Soils
Exposure Medium. Particulates
Exposure Point. Particulate Dust Inhalation from Surface Soils
Receptor Population. Recreational Person
Receptor Age· Youth (Age 5-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv.	1.20E-02	ug/kg	1.20E-02	ug/kg	M	4.11E-17	mg/kg-day	1.50E+05	1/(mg/kg-day)	6 16E-12
	Arsenic	6.36E+00	mg/kg	6 36E+00	mg/kg	M	2 18E-11	mg/kg-day	1.51E+01	1/(mg/kg-day)	3.29E-10
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 89E-11	mg/kg-day	4 10E+01	1/(mg/kg-day)	2.01E-09
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 70E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2.90E+02	mg/kg	M	9 92E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1.74E+01	mg/kg	1 74E+01	mg/kg	M	5 95E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3.71E+01	ug/kg	3.71E+01	ug/kg	M	1 27E-13	mg/kg-day	2.00E+00	1/(mg/kg-day)	2 54E-13
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1.40E+02	ug/kg	M	4 79E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5.59E+02	ug/kg	5.59E+02	ug/kg	M	1 91E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5.53E+02	ug/kg	5.53E+02	ug/kg	M	1 89E-12	mg/kg-day	3.10E+00	1/(mg/kg-day)	5 87E-12
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 19E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3.37E+02	ug/kg	3 37E+02	ug/kg	M	1 15E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3.18E+02	ug/kg	3 18E+02	ug/kg	M	1 09E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5 33E+02	ug/kg	5.33E+02	ug/kg	M	1.82E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3.61E+02	ug/kg	M	1 24E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3.68E+02	ug/kg	M	1.26E-12	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										2.35E-09

TABLE 6-8.13
CALCULATION OF CANCER RISKS - ADULT RECREATIONAL PERSON CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	3 48E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	5 22E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 84E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	2 77E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 14E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	1 44E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	8 41E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5 04E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 08E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 15E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	4 06E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 62E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 18E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 60E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 17E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	1 85E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 35E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	9 77E-09	mg/kg-day	7 30E-02	1/(mg/kg-day)	7 13E-10
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	9 22E-09	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 84E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 54E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 13E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 05E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	7 64E-08
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 07E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 79E-09
	(Total)										5 58E-07
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	9 76E-14	mg/kg-day	1 50E+05	1/(mg/kg-day)	1 46E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	5 17E-08	mg/kg-day	1 50E+00	1/(mg/kg-day)	7 76E-08
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 41E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 82E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	1 97E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 44E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	1 95E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 42E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 25E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 64E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 19E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	8 67E-10
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 12E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 24E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	1 88E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 37E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 27E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	9 29E-08
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 30E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	9 47E-09
	(Total)										3 72E-07
										Total of Routes	9 30E-07

TABLE 6-8.14
CALCULATION OF CANCER RISKS - ADULT RECREATIONAL PERSON PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Surface Soils
Exposure Medium: Particulates
Exposure Point: Particulate Dust Inhalation from Surface Soils
Receptor Population: Recreational Person
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv.	1 20E-02	ug/kg	1.20E-02	ug/kg	M	3 51E-17	mg/kg-day	1.50E+05	1/(mg/kg-day)	5.27E-12
	Arsenic	6.36E+00	mg/kg	6 36E+00	mg/kg	M	1.86E-11	mg/kg-day	1 51E+01	1/(mg/kg-day)	2.81E-10
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	4 19E-11	mg/kg-day	4.10E+01	1/(mg/kg-day)	1.72E-09
	Lead	4 97E+01	mg/kg	4.97E+01	mg/kg	M	1 46E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2.90E+02	mg/kg	2.90E+02	mg/kg	M	8 49E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	5.09E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3.71E+01	ug/kg	3 71E+01	ug/kg	M	1.09E-13	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 17E-13
	4-Chloro-3-methylphenol	1.40E+02	ug/kg	1.40E+02	ug/kg	M	4 10E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5.59E+02	ug/kg	5.59E+02	ug/kg	M	1.64E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5.53E+02	ug/kg	5 53E+02	ug/kg	M	1.62E-12	mg/kg-day	3.10E+00	1/(mg/kg-day)	5 02E-12
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6.39E+02	ug/kg	M	1 87E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3.37E+02	ug/kg	M	9 87E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3 18E+02	ug/kg	3.18E+02	ug/kg	M	9 31E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5.33E+02	ug/kg	5.33E+02	ug/kg	M	1 56E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3.61E+02	ug/kg	3 61E+02	ug/kg	M	1.06E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1.08E-12	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										2 01E-09

TABLE 6-8.15
CALCULATION OF CANCER RISKS - ADULT EXCAVATION WORKER CONTACT WITH SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Surface Soils
Exposure Medium Surface Soils
Exposure Point Contact with Surface Soils
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	5 02E-13	mg/kg-day	1 50E+05	1/(mg/kg-day)	7 54E-08
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	2 66E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	3 99E-07
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	5 99E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	2 08E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	1 21E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	7 28E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	1 55E-09	mg/kg-day	2 00E+00	1/(mg/kg-day)	3 11E-09
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	5 86E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	2 34E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 71E-08
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	2 32E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 69E-07
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	2 68E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 95E-08
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	1 41E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 03E-09
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	1 33E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 66E-10
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	2 23E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 63E-10
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	1 51E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 10E-07
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	1 54E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 12E-08
	(Total)										8 07E-07
Dermal	Total 2,3,7,8-TCDD Equiv	1 20E-02	ug/kg	1 20E-02	ug/kg	M	1 76E-14	mg/kg-day	1 50E+05	1/(mg/kg-day)	2 64E-09
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	9 34E-09	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 40E-08
	Chromium	1 43E+01	mg/kg	1 43E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 97E+01	mg/kg	4 97E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2 90E+02	mg/kg	2 90E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 74E+01	mg/kg	1 74E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3 71E+01	ug/kg	3 71E+01	ug/kg	M	2 54E-10	mg/kg-day	2 00E+00	1/(mg/kg-day)	5 08E-10
	4-Chloro-3-methylphenol	1 40E+02	ug/kg	1 40E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5 59E+02	ug/kg	5 59E+02	ug/kg	M	3 56E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 60E-09
	Benzo(a)pyrene	5 53E+02	ug/kg	5 53E+02	ug/kg	M	3 52E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 57E-08
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6 39E+02	ug/kg	M	4 07E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 97E-09
	Benzo(k)fluoranthene	3 37E+02	ug/kg	3 37E+02	ug/kg	M	2 14E-09	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 57E-10
	Carbazole	3 18E+02	ug/kg	3 18E+02	ug/kg	M	2 02E-09	mg/kg-day	2 00E-02	1/(mg/kg-day)	4 05E-11
	Chrysene	5 33E+02	ug/kg	5 33E+02	ug/kg	M	3 39E-09	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 48E-11
	Dibenz(a,h)anthracene	3 61E+02	ug/kg	3 61E+02	ug/kg	M	2 30E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 68E-08
	Indeno(1,2,3-cd)pyrene	3 68E+02	ug/kg	3 68E+02	ug/kg	M	2 34E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 71E-09
	(Total)										6 71E-08
										Total of Routes	8 74E-07

TABLE 6-8.16
CALCULATION OF CANCER RISKS - ADULT EXCAVATION WORKER PARTICULATE DUST INHALATION FROM SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe· Future
Medium· Surface Soils
Exposure Medium. Particulates
Exposure Point· Particulate Dust Inhalation from Surface Soils
Receptor Population· Excavation Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Total 2,3,7,8-TCDD Equiv	1.20E-02	ug/kg	1.20E-02	ug/kg	M	2 09E-17	mg/kg-day	1.50E+05	1/(mg/kg-day)	3 14E-12
	Arsenic	6 36E+00	mg/kg	6 36E+00	mg/kg	M	1 11E-11	mg/kg-day	1.51E+01	1/(mg/kg-day)	1 68E-10
	Chromium	1.43E+01	mg/kg	1 43E+01	mg/kg	M	2.49E-11	mg/kg-day	4 10E+01	1/(mg/kg-day)	1.02E-09
	Lead	4 97E+01	mg/kg	4.97E+01	mg/kg	M	8.67E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	2.90E+02	mg/kg	2.90E+02	mg/kg	M	5 06E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1.74E+01	mg/kg	1.74E+01	mg/kg	M	3.04E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Aroclor-1254	3.71E+01	ug/kg	3 71E+01	ug/kg	M	6 47E-14	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 29E-13
	4-Chloro-3-methylphenol	1.40E+02	ug/kg	1.40E+02	ug/kg	M	2 44E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	5.59E+02	ug/kg	5.59E+02	ug/kg	M	9.75E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	5.53E+02	ug/kg	5 53E+02	ug/kg	M	9 65E-13	mg/kg-day	3.10E+00	1/(mg/kg-day)	2 99E-12
	Benzo(b)fluoranthene	6 39E+02	ug/kg	6.39E+02	ug/kg	M	1.11E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	3.37E+02	ug/kg	3 37E+02	ug/kg	M	5 88E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	3.18E+02	ug/kg	3 18E+02	ug/kg	M	5 55E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	5 33E+02	ug/kg	5.33E+02	ug/kg	M	9.30E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	3.61E+02	ug/kg	3.61E+02	ug/kg	M	6.30E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	3.68E+02	ug/kg	3.68E+02	ug/kg	M	6 42E-13	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 20E-09

TABLE 6-8.17
CALCULATION OF CANCER RISKS - LIFETIME RESIDENT CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point Contact with Subsurface Soils
Receptor Population Resident
Receptor Age Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	2 92E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	1 01E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 52E-05
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	5 02E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	1 63E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	1 54E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	1 10E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	6 31E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	1 96E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	5 41E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	6 98E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	1 12E-07
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	1 03E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	1 23E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	8 99E-07
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	1 21E-06	mg/kg-day	7 30E+00	1/(mg/kg-day)	8 84E-06
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	1 08E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 89E-07
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	7 05E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	5 14E-08
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	2 20E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	4 40E-09
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	1 26E-06	mg/kg-day	7 30E-03	1/(mg/kg-day)	9 21E-09
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	5 14E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 75E-06
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	8 61E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 28E-07
	(Total)										3 03E-05
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	1 19E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 79E-06
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	1 60E+01	1/(mg/kg-day)	--
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	6 30E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 60E-07
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	6 20E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	4 53E-06
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	5 53E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 04E-07
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	3 61E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 63E-08
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	1 13E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 25E-09
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	6 46E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	4 71E-09
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	2 63E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 92E-06
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	4 41E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 22E-07
	(Total)										9 45E-06
										Total of Routes	3 97E-05

TABLE 6-8.18
CALCULATION OF CANCER RISKS - LIFETIME RESIDENT PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium: Subsurface Soils
Exposure Medium Particulates
Exposure Point: Particulate Dust Inhalation from Subsurface Soils
Receptor Population Resident
Receptor Age. Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Antimony	9.08E+00	mg/kg	9.08E+00	mg/kg	M	8.51E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.69E-09	mg/kg-day	1.51E+01	1/(mg/kg-day)	2.56E-08
	Chromium	1.56E+01	mg/kg	1.56E+01	mg/kg	M	2.62E-09	mg/kg-day	4.10E+01	1/(mg/kg-day)	1.07E-07
	Lead	5.07E+02	mg/kg	5.07E+02	mg/kg	M	4.75E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4.77E+02	mg/kg	4.77E+02	mg/kg	M	4.47E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3.40E-01	mg/kg	3.40E-01	mg/kg	M	3.19E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1.96E+01	mg/kg	1.96E+01	mg/kg	M	1.84E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6.09E+02	mg/kg	6.09E+02	mg/kg	M	5.71E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1.68E+00	ug/kg	1.68E+00	ug/kg	M	1.57E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6.97E+00	ug/kg	6.97E+00	ug/kg	M	1.17E-12	mg/kg-day	1.60E+01	1/(mg/kg-day)	1.87E-11
	4,6-Dinitro-2-methylphenol	3.20E+02	ug/kg	3.20E+02	ug/kg	M	3.00E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.23E+03	ug/kg	1.23E+03	ug/kg	M	1.15E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	1.21E+03	ug/kg	1.21E+03	ug/kg	M	2.03E-10	mg/kg-day	3.10E+00	1/(mg/kg-day)	6.29E-10
	Benzo(b)fluoranthene	1.08E+03	ug/kg	1.08E+03	ug/kg	M	1.01E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	7.04E+02	ug/kg	7.04E+02	ug/kg	M	6.60E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	2.20E+02	ug/kg	2.20E+02	ug/kg	M	2.06E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	1.26E+03	ug/kg	1.26E+03	ug/kg	M	1.18E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	5.13E+02	ug/kg	5.13E+02	ug/kg	M	4.81E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	8.60E+02	ug/kg	8.60E+02	ug/kg	M	8.06E-11	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1.34E-07

TABLE 6-8.19
CALCULATION OF CANCER RISKS - CHILD RESIDENT CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point Contact with Subsurface Soils
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	6 17E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	6 86E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 03E-05
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	1 06E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	3 44E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	3 24E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	2 31E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	1 33E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	4 14E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	1 14E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	4 73E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	7 57E-08
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	2 17E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	8 35E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 10E-07
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	8 22E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 00E-06
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	7 33E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	5 35E-07
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	4 78E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	3 49E-08
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	1 49E-07	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 99E-09
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	8 56E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	6 25E-09
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	3 48E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 54E-06
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	5 84E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 26E-07
	(Total)										2 05E-05
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	6 47E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	9 70E-07
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	1 60E+01	1/(mg/kg-day)	NA
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	3 41E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 49E-07
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	3 36E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 45E-06
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	3 00E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 19E-07
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	1 95E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 43E-08
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	6 10E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 22E-09
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	3 50E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 55E-09
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	1 42E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 04E-06
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	2 39E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 74E-07
	(Total)										5 12E-06
										Total of Routes	2 56E-05

TABLE 6-8.20
CALCULATION OF CANCER RISKS - CHILD RESIDENT PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium. Subsurface Soils
Exposure Medium: Particulates
Exposure Point Particulate Dust Inhalation from Subsurface Soils
Receptor Population. Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Antimony	9 08E+00	mg/kg	9.08E+00	mg/kg	M	6.73E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1.01E+01	mg/kg	1.01E+01	mg/kg	M	7 48E-10	mg/kg-day	1 51E+01	1/(mg/kg-day)	1.13E-08
	Chromium	1.56E+01	mg/kg	1.56E+01	mg/kg	M	1 16E-09	mg/kg-day	4 10E+01	1/(mg/kg-day)	4.74E-08
	Lead	5.07E+02	mg/kg	5 07E+02	mg/kg	M	3 76E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4.77E+02	mg/kg	4 77E+02	mg/kg	M	3 53E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3.40E-01	mg/kg	3.40E-01	mg/kg	M	2 52E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1.96E+01	mg/kg	1.96E+01	mg/kg	M	1 45E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6.09E+02	mg/kg	6 09E+02	mg/kg	M	4 51E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1.68E+00	ug/kg	1 68E+00	ug/kg	M	1.24E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6.97E+00	ug/kg	6 97E+00	ug/kg	M	5 16E-13	mg/kg-day	1 60E+01	1/(mg/kg-day)	8.26E-12
	4,6-Dinitro-2-methylphenol	3.20E+02	ug/kg	3.20E+02	ug/kg	M	2.37E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.23E+03	ug/kg	1.23E+03	ug/kg	M	9 11E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	1.21E+03	ug/kg	1.21E+03	ug/kg	M	8 96E-11	mg/kg-day	3.10E+00	1/(mg/kg-day)	2.78E-10
	Benzo(b)fluoranthene	1.08E+03	ug/kg	1 08E+03	ug/kg	M	8.00E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	7.04E+02	ug/kg	7.04E+02	ug/kg	M	5 22E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	2.20E+02	ug/kg	2.20E+02	ug/kg	M	1.63E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	1.26E+03	ug/kg	1.26E+03	ug/kg	M	9.33E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	5.13E+02	ug/kg	5 13E+02	ug/kg	M	3 80E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	8.60E+02	ug/kg	8.60E+02	ug/kg	M	6.37E-11	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										5 90E-08

TABLE 6-8.21
CALCULATION OF CANCER RISKS - ADULT RESIDENT CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point: Contact with Subsurface Soils
Receptor Population Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	2 92E-06	mg/kg-day	–	1/(mg/kg-day)	–
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	3 25E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	4 88E-06
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	5 02E-06	mg/kg-day	–	1/(mg/kg-day)	–
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	1 63E-04	mg/kg-day	–	1/(mg/kg-day)	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	1 54E-04	mg/kg-day	–	1/(mg/kg-day)	–
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	1 10E-07	mg/kg-day	–	1/(mg/kg-day)	–
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	6 31E-06	mg/kg-day	–	1/(mg/kg-day)	–
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	1 96E-04	mg/kg-day	–	1/(mg/kg-day)	–
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	5 41E-10	mg/kg-day	–	1/(mg/kg-day)	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	2 24E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	3 59E-08
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	1 03E-07	mg/kg-day	–	1/(mg/kg-day)	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	3 96E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 89E-07
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	3 90E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 84E-06
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	3 48E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 54E-07
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	2 27E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 66E-08
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	7 09E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 42E-09
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	4 06E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 96E-09
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	1 65E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 21E-06
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	2 77E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 02E-07
	(Total)										9 73E-06
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	5 48E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	8 21E-07
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	1 60E+01	1/(mg/kg-day)	NA
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	2 89E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 11E-07
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	2 84E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 08E-06
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	2 54E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 85E-07
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	1 65E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 21E-08
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	5 17E-08	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 03E-09
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	2 96E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 16E-09
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	1 21E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	8 80E-07
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	2 02E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 47E-07
	(Total)										4 34E-06
										Total of Routes	1 41E-05

TABLE 6-8.22
CALCULATION OF CANCER RISKS - ADULT RESIDENT PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Subsurface Soils
Receptor Population: Resident
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Antimony	9.08E+00	mg/kg	9.08E+00	mg/kg	M	8 51E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1 01E+01	mg/kg	1.01E+01	mg/kg	M	9 46E-10	mg/kg-day	1.51E+01	1/(mg/kg-day)	1.43E-08
	Chromium	1.56E+01	mg/kg	1.56E+01	mg/kg	M	1 46E-09	mg/kg-day	4.10E+01	1/(mg/kg-day)	5 99E-08
	Lead	5 07E+02	mg/kg	5.07E+02	mg/kg	M	4 75E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 77E+02	mg/kg	4.77E+02	mg/kg	M	4 47E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3.40E-01	mg/kg	3 40E-01	mg/kg	M	3 19E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	1.84E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	5 71E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1.68E+00	ug/kg	1.68E+00	ug/kg	M	1.57E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6.97E+00	ug/kg	6.97E+00	ug/kg	M	6.53E-13	mg/kg-day	1 60E+01	1/(mg/kg-day)	1.04E-11
	4,6-Dinitro-2-methylphenol	3.20E+02	ug/kg	3.20E+02	ug/kg	M	3 00E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 23E+03	ug/kg	1.23E+03	ug/kg	M	1 15E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	1 21E+03	ug/kg	1.21E+03	ug/kg	M	1.13E-10	mg/kg-day	3.10E+00	1/(mg/kg-day)	3 51E-10
	Benzo(b)fluoranthene	1.08E+03	ug/kg	1.08E+03	ug/kg	M	1 01E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	7.04E+02	ug/kg	7 04E+02	ug/kg	M	6.60E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	2 20E+02	ug/kg	2.20E+02	ug/kg	M	2.06E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	1.26E+03	ug/kg	1 26E+03	ug/kg	M	1.18E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5.13E+02	ug/kg	M	4.81E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8.60E+02	ug/kg	M	8.06E-11	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										7.46E-08

TABLE 6-8.23
CALCULATION OF CANCER RISKS - ADULT EXCAVATION WORKER CONTACT WITH SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Subsurface Soils
Exposure Medium Subsurface Soils
Exposure Point: Contact with Subsurface Soils
Receptor Population Excavation Worker
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	3 80E-07	mg/kg-day	–	1/(mg/kg-day)	–
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	4 23E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	6 34E-07
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	6 53E-07	mg/kg-day	–	1/(mg/kg-day)	–
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	2 12E-05	mg/kg-day	–	1/(mg/kg-day)	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	2 00E-05	mg/kg-day	–	1/(mg/kg-day)	–
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	1 42E-08	mg/kg-day	–	1/(mg/kg-day)	–
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	8 21E-07	mg/kg-day	–	1/(mg/kg-day)	–
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	2 55E-05	mg/kg-day	–	1/(mg/kg-day)	–
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	7 03E-11	mg/kg-day	–	1/(mg/kg-day)	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	2 92E-10	mg/kg-day	1 60E+01	1/(mg/kg-day)	4 67E-09
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	1 34E-08	mg/kg-day	–	1/(mg/kg-day)	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	5 15E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 76E-08
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	5 07E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 70E-07
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	4 52E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 30E-08
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	2 95E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 15E-09
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	9 21E-09	mg/kg-day	2 00E-02	1/(mg/kg-day)	1 84E-10
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	5 28E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	3 85E-10
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	2 15E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 57E-07
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	3 60E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 63E-08
	(Total)										1 27E-06
Dermal	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Arsenic	1 01E+01	mg/kg	1 01E+01	mg/kg	M	1 48E-08	mg/kg-day	1 50E+00	1/(mg/kg-day)	2 22E-08
	Chromium	1 56E+01	mg/kg	1 56E+01	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Lead	5 07E+02	mg/kg	5 07E+02	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Manganese	4 77E+02	mg/kg	4 77E+02	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Mercury	3 40E-01	mg/kg	3 40E-01	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Zinc	6 09E+02	mg/kg	6 09E+02	mg/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Delta-BHC	1 68E+00	ug/kg	1 68E+00	ug/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Dieldrin	6 97E+00	ug/kg	6 97E+00	ug/kg	M	NA	mg/kg-day	1 60E+01	1/(mg/kg-day)	NA
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3 20E+02	ug/kg	M	NA	mg/kg-day	–	1/(mg/kg-day)	–
	Benz(a)anthracene	1 23E+03	ug/kg	1 23E+03	ug/kg	M	7 83E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	5 71E-09
	Benzo(a)pyrene	1 21E+03	ug/kg	1 21E+03	ug/kg	M	7 70E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	5 62E-08
	Benzo(b)fluoranthene	1 08E+03	ug/kg	1 08E+03	ug/kg	M	6 87E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	5 02E-09
	Benzo(k)fluoranthene	7 04E+02	ug/kg	7 04E+02	ug/kg	M	4 48E-09	mg/kg-day	7 30E-02	1/(mg/kg-day)	3 27E-10
	Carbazole	2 20E+02	ug/kg	2 20E+02	ug/kg	M	1 40E-09	mg/kg-day	2 00E-02	1/(mg/kg-day)	2 80E-11
	Chrysene	1 26E+03	ug/kg	1 26E+03	ug/kg	M	8 02E-09	mg/kg-day	7 30E-03	1/(mg/kg-day)	5 85E-11
	Dibenz(a,h)anthracene	5 13E+02	ug/kg	5 13E+02	ug/kg	M	3 26E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 38E-08
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8 60E+02	ug/kg	M	5 47E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 99E-09
	(Total)										1 17E-07
										Total of Routes	1 38E-06

TABLE 6-8.24
CALCULATION OF CANCER RISKS - ADULT EXCAVATION WORKER PARTICULATE DUST INHALATION FROM SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium Subsurface Soils
Exposure Medium Particulates
Exposure Point Particulate Dust Inhalation from Subsurface Soils
Receptor Population Excavation Worker
Receptor Age. Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Antimony	9 08E+00	mg/kg	9 08E+00	mg/kg	M	1 58E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Arsenic	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1 76E-11	mg/kg-day	1.51E+01	1/(mg/kg-day)	2.66E-10
	Chromium	1.56E+01	mg/kg	1 56E+01	mg/kg	M	2.72E-11	mg/kg-day	4 10E+01	1/(mg/kg-day)	1.12E-09
	Lead	5.07E+02	mg/kg	5 07E+02	mg/kg	M	8.84E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4.77E+02	mg/kg	4.77E+02	mg/kg	M	8 32E-10	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3.40E-01	mg/kg	3.40E-01	mg/kg	M	5.93E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	1 96E+01	mg/kg	1 96E+01	mg/kg	M	3.42E-11	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	6.09E+02	mg/kg	6 09E+02	mg/kg	M	1.06E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Delta-BHC	1.68E+00	ug/kg	1 68E+00	ug/kg	M	2 93E-15	mg/kg-day	--	1/(mg/kg-day)	--
	Dieldrin	6.97E+00	ug/kg	6 97E+00	ug/kg	M	1 22E-14	mg/kg-day	1.60E+01	1/(mg/kg-day)	1.95E-13
	4,6-Dinitro-2-methylphenol	3 20E+02	ug/kg	3.20E+02	ug/kg	M	5.58E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.23E+03	ug/kg	1.23E+03	ug/kg	M	2 15E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(a)pyrene	1 21E+03	ug/kg	1.21E+03	ug/kg	M	2 11E-12	mg/kg-day	3.10E+00	1/(mg/kg-day)	6 54E-12
	Benzo(b)fluoranthene	1.08E+03	ug/kg	1 08E+03	ug/kg	M	1.88E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	7.04E+02	ug/kg	7.04E+02	ug/kg	M	1.23E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Carbazole	2.20E+02	ug/kg	2 20E+02	ug/kg	M	3.84E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Chrysene	1.26E+03	ug/kg	1.26E+03	ug/kg	M	2.20E-12	mg/kg-day	--	1/(mg/kg-day)	--
	Dibenz(a,h)anthracene	5.13E+02	ug/kg	5.13E+02	ug/kg	M	8.95E-13	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	8 60E+02	ug/kg	8.60E+02	ug/kg	M	1.50E-12	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1.39E-09

TABLE 6-8.25
CALCULATION OF CANCER RISKS - LIFETIME RESIDENT CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium. Sediment
Exposure Medium: Sediment
Exposure Point Contact with Sediment
Receptor Population Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.53E+00	mg/kg	6.53E+00	mg/kg	M	3.27E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	4.90E-06
	Manganese	1.24E+03	mg/kg	1.24E+03	mg/kg	M	2 00E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.90E+03	ug/kg	1 90E+03	ug/kg	M	9.51E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	6.94E-07
	Benzo(a)pyrene	1 40E+03	ug/kg	1.40E+03	ug/kg	M	7.01E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	5 12E-06
	Benzo(b)fluoranthene	1.70E+03	ug/kg	1 70E+03	ug/kg	M	8 51E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	6 21E-07
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7.20E+02	ug/kg	M	3.60E-07	mg/kg-day	7.30E-02	1/(mg/kg-day)	2.63E-08
	Chrysene	1.70E+03	ug/kg	1.70E+03	ug/kg	M	8 51E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	6.21E-09
	Dibenz(a,h)anthracene	2.90E+02	ug/kg	2 90E+02	ug/kg	M	1 45E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1.06E-06
	Indeno(1,2,3-cd)pyrene	1.00E+03	ug/kg	1.00E+03	ug/kg	M	5 01E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	3.65E-07
	(Total)										1 28E-05
Dermal	Arsenic	6.53E+00	mg/kg	6 53E+00	mg/kg	M	7 88E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 18E-06
	Manganese	1.24E+03	mg/kg	1.24E+03	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.90E+03	ug/kg	1.90E+03	ug/kg	M	9.94E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	7.26E-07
	Benzo(a)pyrene	1.40E+03	ug/kg	1 40E+03	ug/kg	M	7 32E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	5 35E-06
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	8.89E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	6.49E-07
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7.20E+02	ug/kg	M	3.77E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 75E-08
	Chrysene	1 70E+03	ug/kg	1.70E+03	ug/kg	M	8.89E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	6.49E-09
	Dibenz(a,h)anthracene	2.90E+02	ug/kg	2 90E+02	ug/kg	M	1 52E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1.11E-06
	Indeno(1,2,3-cd)pyrene	1.00E+03	ug/kg	1.00E+03	ug/kg	M	5.23E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	3 82E-07
	(Total)										9.43E-06
										Total of Routes	2.22E-05

TABLE 6-8.26
CALCULATION OF CANCER RISKS - CHILD RESIDENT CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe· Future
Medium: Sediment
Exposure Medium Sediment
Exposure Point Contact with Sediment
Receptor Population Resident
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.53E+00	mg/kg	6 53E+00	mg/kg	M	2.22E-06	mg/kg-day	1.50E+00	1/(mg/kg-day)	3.33E-06
	Manganese	1 24E+03	mg/kg	1.24E+03	mg/kg	M	4 21E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.90E+03	ug/kg	1.90E+03	ug/kg	M	6.45E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4.71E-07
	Benzo(a)pyrene	1.40E+03	ug/kg	1 40E+03	ug/kg	M	4.75E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	3.47E-06
	Benzo(b)fluoranthene	1.70E+03	ug/kg	1 70E+03	ug/kg	M	5 77E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	4.21E-07
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7.20E+02	ug/kg	M	2.44E-07	mg/kg-day	7.30E-02	1/(mg/kg-day)	1 78E-08
	Chrysene	1 70E+03	ug/kg	1.70E+03	ug/kg	M	5 77E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	4.21E-09
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2.90E+02	ug/kg	M	9 85E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	7.19E-07
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	3 40E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2.48E-07
	(Total)										8.68E-06
Dermal	Arsenic	6 53E+00	mg/kg	6.53E+00	mg/kg	M	2 51E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	3.76E-07
	Manganese	1 24E+03	mg/kg	1 24E+03	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 90E+03	ug/kg	1.90E+03	ug/kg	M	3 16E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	2.31E-07
	Benzo(a)pyrene	1 40E+03	ug/kg	1.40E+03	ug/kg	M	2 33E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1.70E-06
	Benzo(b)fluoranthene	1.70E+03	ug/kg	1 70E+03	ug/kg	M	2.83E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 07E-07
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7.20E+02	ug/kg	M	1.20E-07	mg/kg-day	7.30E-02	1/(mg/kg-day)	8.75E-09
	Chrysene	1 70E+03	ug/kg	1.70E+03	ug/kg	M	2 83E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	2.07E-09
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2.90E+02	ug/kg	M	4.83E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	3.53E-07
	Indeno(1,2,3-cd)pyrene	1.00E+03	ug/kg	1 00E+03	ug/kg	M	1.67E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	1.22E-07
	(Total)										3.00E-06
										Total of Routes	1.17E-05

TABLE 6-8.27
CALCULATION OF CANCER RISKS - ADULT RESIDENT CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium· Sediment
Exposure Medium: Sediment
Exposure Point Contact with Sediment
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.53E+00	mg/kg	6.53E+00	mg/kg	M	1 05E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	1.58E-06
	Manganese	1.24E+03	mg/kg	1.24E+03	mg/kg	M	2.00E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 90E+03	ug/kg	1.90E+03	ug/kg	M	3.06E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	2.23E-07
	Benzo(a)pyrene	1 40E+03	ug/kg	1.40E+03	ug/kg	M	2 25E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1.65E-06
	Benzo(b)fluoranthene	1.70E+03	ug/kg	1 70E+03	ug/kg	M	2.74E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	2 00E-07
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7.20E+02	ug/kg	M	1.16E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	8 46E-09
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2 74E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	2 00E-09
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2.90E+02	ug/kg	M	4 67E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 41E-07
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1.00E+03	ug/kg	M	1 61E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1.18E-07
	(Total)										4.12E-06
Dermal	Arsenic	6 53E+00	mg/kg	6.53E+00	mg/kg	M	5.37E-07	mg/kg-day	1.50E+00	1/(mg/kg-day)	8 06E-07
	Manganese	1.24E+03	mg/kg	1.24E+03	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.90E+03	ug/kg	1.90E+03	ug/kg	M	6.77E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	4.95E-07
	Benzo(a)pyrene	1 40E+03	ug/kg	1.40E+03	ug/kg	M	4.99E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	3.64E-06
	Benzo(b)fluoranthene	1.70E+03	ug/kg	1.70E+03	ug/kg	M	6.06E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	4 42E-07
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7.20E+02	ug/kg	M	2.57E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1.87E-08
	Chrysene	1.70E+03	ug/kg	1.70E+03	ug/kg	M	6.06E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	4 42E-09
	Dibenz(a,h)anthracene	2.90E+02	ug/kg	2.90E+02	ug/kg	M	1 03E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	7.55E-07
	Indeno(1,2,3-cd)pyrene	1.00E+03	ug/kg	1.00E+03	ug/kg	M	3.57E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	2.60E-07
	(Total)										6 43E-06
										Total of Routes	1.05E-05

TABLE 6-8.28
CALCULATION OF CANCER RISKS - YOUTH (AGE 1-12) SHORELINE VISITOR CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium Sediment
Exposure Point: Contact with Sediment
Receptor Population: Shoreline Visitor
Receptor Age. Youth (Age 1-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.53E+00	mg/kg	6.53E+00	mg/kg	M	1.80E-07	mg/kg-day	1 50E+00	1/(mg/kg-day)	2.70E-07
	Manganese	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1 79E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	5 24E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3.83E-08
	Benzo(a)pyrene	1.40E+03	ug/kg	1 40E+03	ug/kg	M	3 86E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 82E-07
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	4 69E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 42E-08
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7 20E+02	ug/kg	M	1 99E-08	mg/kg-day	7.30E-02	1/(mg/kg-day)	1.45E-09
	Chrysene	1.70E+03	ug/kg	1 70E+03	ug/kg	M	4 69E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	3 42E-10
	Dibenz(a,h)anthracene	2.90E+02	ug/kg	2 90E+02	ug/kg	M	8 00E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	5 84E-08
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1.00E+03	ug/kg	M	2 76E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	2 01E-08
	(Total)										7 05E-07
Dermal	Arsenic	6.53E+00	mg/kg	6.53E+00	mg/kg	M	3 49E-08	mg/kg-day	1.50E+00	1/(mg/kg-day)	5.23E-08
	Manganese	1 24E+03	mg/kg	1.24E+03	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 90E+03	ug/kg	1.90E+03	ug/kg	M	4.39E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3.21E-08
	Benzo(a)pyrene	1.40E+03	ug/kg	1.40E+03	ug/kg	M	3.24E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	2.36E-07
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1.70E+03	ug/kg	M	3.93E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	2.87E-08
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7.20E+02	ug/kg	M	1.67E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	1.22E-09
	Chrysene	1.70E+03	ug/kg	1.70E+03	ug/kg	M	3.93E-08	mg/kg-day	7.30E-03	1/(mg/kg-day)	2.87E-10
	Dibenz(a,h)anthracene	2.90E+02	ug/kg	2.90E+02	ug/kg	M	6.71E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	4.90E-08
	Indeno(1,2,3-cd)pyrene	1.00E+03	ug/kg	1.00E+03	ug/kg	M	2.31E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	1.69E-08
	(Total)										4.17E-07
										Total of Routes	1.12E-06

TABLE 6-8.29
CALCULATION OF CANCER RISKS - CHILD (AGE 1-4) SHORELINE VISITOR CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point. Contact with Sediment
Receptor Population: Shoreline Visitor
Receptor Age: Child (Age 1-4)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6.53E+00	mg/kg	6 53E+00	mg/kg	M	8.58E-08	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 29E-07
	Manganese	1.24E+03	mg/kg	1 24E+03	mg/kg	M	1 63E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.90E+03	ug/kg	1.90E+03	ug/kg	M	2 50E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1.82E-08
	Benzo(a)pyrene	1 40E+03	ug/kg	1.40E+03	ug/kg	M	1.84E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 34E-07
	Benzo(b)fluoranthene	1.70E+03	ug/kg	1.70E+03	ug/kg	M	2 23E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 63E-08
	Benzo(k)fluoranthene	7 20E+02	ug/kg	7.20E+02	ug/kg	M	9 46E-09	mg/kg-day	7 30E-02	1/(mg/kg-day)	6 91E-10
	Chrysene	1.70E+03	ug/kg	1 70E+03	ug/kg	M	2 23E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 63E-10
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2.90E+02	ug/kg	M	3 81E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	2.78E-08
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1.00E+03	ug/kg	M	1 31E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	9 59E-09
	(Total)										3 36E-07
Dermal	Arsenic	6 53E+00	mg/kg	6.53E+00	mg/kg	M	8.94E-09	mg/kg-day	1.50E+00	1/(mg/kg-day)	1.34E-08
	Manganese	1 24E+03	mg/kg	1.24E+03	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	1.13E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	8.23E-09
	Benzo(a)pyrene	1.40E+03	ug/kg	1 40E+03	ug/kg	M	8 31E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	6.07E-08
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	1 01E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	7.36E-09
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7 20E+02	ug/kg	M	4 27E-09	mg/kg-day	7.30E-02	1/(mg/kg-day)	3 12E-10
	Chrysene	1.70E+03	ug/kg	1.70E+03	ug/kg	M	1.01E-08	mg/kg-day	7.30E-03	1/(mg/kg-day)	7 36E-11
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2.90E+02	ug/kg	M	1.72E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	1.26E-08
	Indeno(1,2,3-cd)pyrene	1.00E+03	ug/kg	1.00E+03	ug/kg	M	5 93E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	4.33E-09
	(Total)										1 07E-07
										Total of Routes	4.43E-07

TABLE 6-8.30
CALCULATION OF CANCER RISKS - YOUTH (AGE 5-12) SHORELINE VISITOR CONTACT WITH SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Current/Future
Medium: Sediment
Exposure Medium· Sediment
Exposure Point· Contact with Sediment
Receptor Population Shoreline Visitor
Receptor Age· Youth (Age 5-12)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	6 53E+00	mg/kg	6.53E+00	mg/kg	M	9 44E-08	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 42E-07
	Manganese	1 24E+03	mg/kg	1.24E+03	mg/kg	M	1.79E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 90E+03	ug/kg	1 90E+03	ug/kg	M	2.75E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	2.00E-08
	Benzo(a)pyrene	1 40E+03	ug/kg	1 40E+03	ug/kg	M	2.02E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	1.48E-07
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2 46E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 79E-08
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7 20E+02	ug/kg	M	1.04E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	7 60E-10
	Chrysene	1 70E+03	ug/kg	1.70E+03	ug/kg	M	2.46E-08	mg/kg-day	7.30E-03	1/(mg/kg-day)	1.79E-10
	Dibenz(a,h)anthracene	2 90E+02	ug/kg	2.90E+02	ug/kg	M	4.19E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 06E-08
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1 45E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	1.05E-08
	(Total)										3 69E-07
Dermal	Arsenic	6.53E+00	mg/kg	6.53E+00	mg/kg	M	2.59E-08	mg/kg-day	1.50E+00	1/(mg/kg-day)	3.89E-08
	Manganese	1.24E+03	mg/kg	1.24E+03	mg/kg	M	NA	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.90E+03	ug/kg	1.90E+03	ug/kg	M	3 27E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	2 38E-08
	Benzo(a)pyrene	1 40E+03	ug/kg	1.40E+03	ug/kg	M	2 41E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	1.76E-07
	Benzo(b)fluoranthene	1 70E+03	ug/kg	1.70E+03	ug/kg	M	2.92E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 13E-08
	Benzo(k)fluoranthene	7.20E+02	ug/kg	7.20E+02	ug/kg	M	1.24E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	9.04E-10
	Chrysene	1 70E+03	ug/kg	1 70E+03	ug/kg	M	2.92E-08	mg/kg-day	7.30E-03	1/(mg/kg-day)	2.13E-10
	Dibenz(a,h)anthracene	2.90E+02	ug/kg	2 90E+02	ug/kg	M	4 99E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	3.64E-08
	Indeno(1,2,3-cd)pyrene	1 00E+03	ug/kg	1 00E+03	ug/kg	M	1.72E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	1 26E-08
	(Total)										3.10E-07
										Total of Routes	6 79E-07

TABLE 6-8.31
CALCULATION OF CANCER RISKS - ADULT SUBSISTENCE FISHERMAN INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium. Lobster
Exposure Medium. Animal Tissue
Exposure Point Ingestion of Lobster
Receptor Population: Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	8 55E+00	mg/kg	8 55E+00	mg/kg	M	8 03E-04	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 20E-03
	Cadmium	1.27E+01	mg/kg	1.27E+01	mg/kg	M	1.19E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1.71E+01	mg/kg	1.71E+01	mg/kg	M	1.61E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	1 59E+01	mg/kg	1.59E+01	mg/kg	M	1.49E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3.53E+00	mg/kg	3 53E+00	mg/kg	M	3 32E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	3 90E+01	mg/kg	3 90E+01	mg/kg	M	3 66E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	3 50E+00	mg/kg	3 50E+00	mg/kg	M	3.29E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	2 73E+02	mg/kg	2 73E+02	mg/kg	M	2 56E-02	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	4.17E-01	ug/kg	4 17E-01	ug/kg	M	3 92E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	9.40E-09
	2,4'-DDT	6 26E-01	ug/kg	6 26E-01	ug/kg	M	5 88E-08	mg/kg-day	3.40E-01	1/(mg/kg-day)	2 00E-08
	4,4'-DDD	1.04E+00	ug/kg	1 04E+00	ug/kg	M	9 77E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 34E-08
	4,4'-DDE	1.30E+01	ug/kg	1 30E+01	ug/kg	M	1 22E-06	mg/kg-day	3 40E-01	1/(mg/kg-day)	4 15E-07
	4,4'-DDT	4 18E-01	ug/kg	4.18E-01	ug/kg	M	3 93E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 33E-08
	Dieldrin	4.47E+00	ug/kg	4.47E+00	ug/kg	M	4 20E-07	mg/kg-day	1 60E+01	1/(mg/kg-day)	6 72E-06
	Total PCB Congeners	2.65E+02	ug/kg	2 65E+02	ug/kg	M	2 49E-05	mg/kg-day	2 00E+00	1/(mg/kg-day)	4 98E-05
	1-Methylphenanthrene	3 14E+00	ug/kg	3.14E+00	ug/kg	M	2 95E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1.45E+00	ug/kg	1 45E+00	ug/kg	M	1 36E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2 00E+00	ug/kg	M	1.88E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	9 46E+01	ug/kg	9 46E+01	ug/kg	M	8 89E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	6.49E-06
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	1 62E-05	mg/kg-day	7.30E+00	1/(mg/kg-day)	1.18E-04
	Benzo(b)fluoranthene	1 87E+02	ug/kg	1 87E+02	ug/kg	M	1 76E-05	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 28E-05
	Benzo(e)pyrene	4.97E+01	ug/kg	4 97E+01	ug/kg	M	4.67E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	8.91E+01	ug/kg	8 91E+01	ug/kg	M	8.37E-06	mg/kg-day	7 30E-02	1/(mg/kg-day)	6.11E-07
	Chrysene	1.18E+02	ug/kg	1.18E+02	ug/kg	M	1.11E-05	mg/kg-day	7 30E-03	1/(mg/kg-day)	8.09E-08
	Dibenz(a,h)anthracene	3 74E+00	ug/kg	3.74E+00	ug/kg	M	3.51E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	2.56E-06
	Indeno(1,2,3-cd)pyrene	1.01E+02	ug/kg	1.01E+02	ug/kg	M	9.49E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	6.93E-06
	Perylene	1.04E+01	ug/kg	1.04E+01	ug/kg	M	9.77E-07	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1.41E-03
										Total of Routes	1.41E-03

TABLE 6-8.32
CALCULATION OF CANCER RISKS - LIFETIME RECREATIONAL PERSON INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium. Lobster
Exposure Medium Animal Tissue
Exposure Point. Ingestion of Lobster
Receptor Population· Recreational Person
Receptor Age Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	8.55E+00	mg/kg	8 55E+00	mg/kg	M	6.50E-05	mg/kg-day	1.50E+00	1/(mg/kg-day)	9.74E-05
	Cadmium	1 27E+01	mg/kg	1.27E+01	mg/kg	M	7 16E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1.71E+01	mg/kg	1 71E+01	mg/kg	M	9 64E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	1.59E+01	mg/kg	1.59E+01	mg/kg	M	8 96E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 53E+00	mg/kg	3.53E+00	mg/kg	M	1.99E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	3 90E+01	mg/kg	3 90E+01	mg/kg	M	2.20E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	3.50E+00	mg/kg	3 50E+00	mg/kg	M	1 97E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	2.73E+02	mg/kg	2 73E+02	mg/kg	M	1 54E-03	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	4 17E-01	ug/kg	4.17E-01	ug/kg	M	3.17E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	7.60E-10
	2,4'-DDT	6.26E-01	ug/kg	6 26E-01	ug/kg	M	4 76E-09	mg/kg-day	3.40E-01	1/(mg/kg-day)	1 62E-09
	4,4'-DDD	1.04E+00	ug/kg	1 04E+00	ug/kg	M	7.90E-09	mg/kg-day	2.40E-01	1/(mg/kg-day)	1.90E-09
	4,4'-DDE	1.30E+01	ug/kg	1.30E+01	ug/kg	M	9 88E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	3.36E-08
	4,4'-DDT	4 18E-01	ug/kg	4.18E-01	ug/kg	M	3 18E-09	mg/kg-day	3.40E-01	1/(mg/kg-day)	1 08E-09
	Dieldrin	4 47E+00	ug/kg	4.47E+00	ug/kg	M	3.40E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	5 43E-07
	Total PCB Congeners	2 65E+02	ug/kg	2 65E+02	ug/kg	M	2 01E-06	mg/kg-day	2.00E+00	1/(mg/kg-day)	4 03E-06
	1-Methylphenanthrene	3.14E+00	ug/kg	3.14E+00	ug/kg	M	1 77E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1.45E+00	ug/kg	M	8 17E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2.00E+00	ug/kg	2.00E+00	ug/kg	M	1.13E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	9 46E+01	ug/kg	9 46E+01	ug/kg	M	7.19E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	5.25E-07
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	1.31E-06	mg/kg-day	7 30E+00	1/(mg/kg-day)	9 54E-06
	Benzo(b)fluoranthene	1.87E+02	ug/kg	1.87E+02	ug/kg	M	1.42E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	1.04E-06
	Benzo(e)pyrene	4 97E+01	ug/kg	4 97E+01	ug/kg	M	2.80E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	8 91E+01	ug/kg	8.91E+01	ug/kg	M	6.77E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	4 94E-08
	Chrysene	1 18E+02	ug/kg	1 18E+02	ug/kg	M	8 96E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	6 54E-09
	Dibenz(a,h)anthracene	3 74E+00	ug/kg	3 74E+00	ug/kg	M	2 84E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	2.07E-07
	Indeno(1,2,3-cd)pyrene	1 01E+02	ug/kg	1.01E+02	ug/kg	M	7.67E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	5 60E-07
	Perylene	1.04E+01	ug/kg	1 04E+01	ug/kg	M	5 86E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 14E-04
										Total of Routes	1.14E-04

TABLE 6-8.33
CALCULATION OF CANCER RISKS - CHILD RECREATIONAL PERSON INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium: Lobster
Exposure Medium: Animal Tissue
Exposure Point. Ingestion of Lobster
Receptor Population· Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	8.55E+00	mg/kg	8.55E+00	mg/kg	M	1.68E-05	mg/kg-day	1.50E+00	1/(mg/kg-day)	2.51E-05
	Cadmium	1 27E+01	mg/kg	1.27E+01	mg/kg	M	2.49E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 71E+01	mg/kg	1 71E+01	mg/kg	M	3.35E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	1.59E+01	mg/kg	1.59E+01	mg/kg	M	3.12E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 53E+00	mg/kg	3 53E+00	mg/kg	M	6.92E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	3.90E+01	mg/kg	3.90E+01	mg/kg	M	7 65E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	3 50E+00	mg/kg	3.50E+00	mg/kg	M	6.86E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	2 73E+02	mg/kg	2 73E+02	mg/kg	M	5.35E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	8.18E-10	mg/kg-day	2 40E-01	1/(mg/kg-day)	1.96E-10
	2,4'-DDT	6 26E-01	ug/kg	6 26E-01	ug/kg	M	1.23E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	4 17E-10
	4,4'-DDD	1 04E+00	ug/kg	1 04E+00	ug/kg	M	2.04E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	4.89E-10
	4,4'-DDE	1.30E+01	ug/kg	1 30E+01	ug/kg	M	2 55E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	8 67E-09
	4,4'-DDT	4.18E-01	ug/kg	4.18E-01	ug/kg	M	8 20E-10	mg/kg-day	3 40E-01	1/(mg/kg-day)	2 79E-10
	Dieldrin	4 47E+00	ug/kg	4 47E+00	ug/kg	M	8 76E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	1 40E-07
	Total PCB Congeners	2.65E+02	ug/kg	2.65E+02	ug/kg	M	5.20E-07	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 04E-06
	1-Methylphenanthrene	3.14E+00	ug/kg	3 14E+00	ug/kg	M	6.16E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	2 84E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2.00E+00	ug/kg	M	3 92E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	9.46E+01	ug/kg	9 46E+01	ug/kg	M	1 85E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	1 35E-07
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	3 37E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	2.46E-06
	Benzo(b)fluoranthene	1.87E+02	ug/kg	1 87E+02	ug/kg	M	3 67E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	2 68E-07
	Benzo(e)pyrene	4 97E+01	ug/kg	4.97E+01	ug/kg	M	9.74E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	8.91E+01	ug/kg	8 91E+01	ug/kg	M	1 75E-07	mg/kg-day	7.30E-02	1/(mg/kg-day)	1.28E-08
	Chrysene	1.18E+02	ug/kg	1.18E+02	ug/kg	M	2 31E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	1 69E-09
	Dibenz(a,h)anthracene	3.74E+00	ug/kg	3.74E+00	ug/kg	M	7.33E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	5 35E-08
	Indeno(1,2,3-cd)pyrene	1.01E+02	ug/kg	1.01E+02	ug/kg	M	1.98E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	1 45E-07
	Perylene	1.04E+01	ug/kg	1.04E+01	ug/kg	M	2.04E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										2 94E-05
										Total of Routes	2.94E-05

TABLE 6-8.34
CALCULATION OF CANCER RISKS - ADULT RECREATIONAL PERSON INGESTION OF LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium Lobster
Exposure Medium Animal Tissue
Exposure Point: Ingestion of Lobster
Receptor Population: Recreational Person
Receptor Age. Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	8 55E+00	mg/kg	8.55E+00	mg/kg	M	4 82E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	7.23E-05
	Cadmium	1 27E+01	mg/kg	1 27E+01	mg/kg	M	7 16E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1.71E+01	mg/kg	1 71E+01	mg/kg	M	9 64E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	1.59E+01	mg/kg	1 59E+01	mg/kg	M	8 96E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 53E+00	mg/kg	3.53E+00	mg/kg	M	1.99E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	3 90E+01	mg/kg	3.90E+01	mg/kg	M	2 20E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	3.50E+00	mg/kg	3 50E+00	mg/kg	M	1 97E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	2 73E+02	mg/kg	2.73E+02	mg/kg	M	1.54E-03	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	2 35E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	5 64E-10
	2,4'-DDT	6 26E-01	ug/kg	6.26E-01	ug/kg	M	3.53E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 20E-09
	4,4'-DDD	1.04E+00	ug/kg	1 04E+00	ug/kg	M	5.86E-09	mg/kg-day	2.40E-01	1/(mg/kg-day)	1.41E-09
	4,4'-DDE	1 30E+01	ug/kg	1 30E+01	ug/kg	M	7 33E-08	mg/kg-day	3.40E-01	1/(mg/kg-day)	2 49E-08
	4,4'-DDT	4 18E-01	ug/kg	4 18E-01	ug/kg	M	2.36E-09	mg/kg-day	3.40E-01	1/(mg/kg-day)	8 01E-10
	Dieldrin	4.47E+00	ug/kg	4 47E+00	ug/kg	M	2.52E-08	mg/kg-day	1.60E+01	1/(mg/kg-day)	4 03E-07
	Total PCB Congeners	2.65E+02	ug/kg	2.65E+02	ug/kg	M	1 49E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 99E-06
	1-Methylphenanthrene	3 14E+00	ug/kg	3.14E+00	ug/kg	M	1.77E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1.45E+00	ug/kg	1 45E+00	ug/kg	M	8 17E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2.00E+00	ug/kg	2 00E+00	ug/kg	M	1.13E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	9.46E+01	ug/kg	9 46E+01	ug/kg	M	5.33E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 89E-07
	Benzo(a)pyrene	1.72E+02	ug/kg	1 72E+02	ug/kg	M	9.69E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	7 08E-06
	Benzo(b)fluoranthene	1.87E+02	ug/kg	1.87E+02	ug/kg	M	1 05E-06	mg/kg-day	7.30E-01	1/(mg/kg-day)	7.69E-07
	Benzo(e)pyrene	4 97E+01	ug/kg	4 97E+01	ug/kg	M	2.80E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	8.91E+01	ug/kg	8.91E+01	ug/kg	M	5.02E-07	mg/kg-day	7.30E-02	1/(mg/kg-day)	3 67E-08
	Chrysene	1.18E+02	ug/kg	1.18E+02	ug/kg	M	6 65E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	4.85E-09
	Dibenz(a,h)anthracene	3.74E+00	ug/kg	3.74E+00	ug/kg	M	2.11E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	1.54E-07
	Indeno(1,2,3-cd)pyrene	1.01E+02	ug/kg	1.01E+02	ug/kg	M	5.69E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4.16E-07
	Perylene	1.04E+01	ug/kg	1 04E+01	ug/kg	M	5 86E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										8 45E-05
										Total of Routes	8.45E-05

TABLE 6-8.35
CALCULATION OF CANCER RISKS - ADULT SUBSISTENCE FISHERMAN INGESTION OF LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medium. Lobster
Exposure Medium Animal Tissue
Exposure Point: Ingestion of Lobster
Receptor Population Subsistence Fisherman
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	8.55E+00	mg/kg	8 55E+00	mg/kg	M	3.01E-04	mg/kg-day	1 50E+00	1/(mg/kg-day)	4 52E-04
	Cadmium	1.27E+01	mg/kg	1 27E+01	mg/kg	M	4 47E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1.71E+01	mg/kg	1 71E+01	mg/kg	M	6 02E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	1.59E+01	mg/kg	1 59E+01	mg/kg	M	5.60E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3.53E+00	mg/kg	3 53E+00	mg/kg	M	1.24E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	3.90E+01	mg/kg	3.90E+01	mg/kg	M	1.37E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	3.50E+00	mg/kg	3.50E+00	mg/kg	M	1.23E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	2.73E+02	mg/kg	2.73E+02	mg/kg	M	9 62E-03	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	1.47E-08	mg/kg-day	2.40E-01	1/(mg/kg-day)	3 53E-09
-	2,4'-DDT	6.26E-01	ug/kg	6.26E-01	ug/kg	M	2 21E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	7 50E-09
	4,4'-DDD	1.04E+00	ug/kg	1 04E+00	ug/kg	M	3.66E-08	mg/kg-day	2.40E-01	1/(mg/kg-day)	8 79E-09
	4,4'-DDE	1.30E+01	ug/kg	1 30E+01	ug/kg	M	4 58E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 56E-07
	4,4'-DDT	4.18E-01	ug/kg	4 18E-01	ug/kg	M	1 47E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	5 01E-09
	Dieldrin	4.47E+00	ug/kg	4 47E+00	ug/kg	M	1 57E-07	mg/kg-day	1 60E+01	1/(mg/kg-day)	2 52E-06
	Total PCB Congeners	2.65E+02	ug/kg	2 65E+02	ug/kg	M	9.33E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 87E-05
	1-Methylphenanthrene	3.14E+00	ug/kg	3 14E+00	ug/kg	M	1.11E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1.45E+00	ug/kg	M	5.11E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2 00E+00	ug/kg	M	7.05E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	9.46E+01	ug/kg	9.46E+01	ug/kg	M	3 33E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 43E-06
	Benzo(a)pyrene	1.72E+02	ug/kg	1 72E+02	ug/kg	M	6.06E-06	mg/kg-day	7 30E+00	1/(mg/kg-day)	4.42E-05
	Benzo(b)fluoranthene	1.87E+02	ug/kg	1.87E+02	ug/kg	M	6.59E-06	mg/kg-day	7.30E-01	1/(mg/kg-day)	4 81E-06
	Benzo(e)pyrene	4.97E+01	ug/kg	4.97E+01	ug/kg	M	1.75E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	8 91E+01	ug/kg	8 91E+01	ug/kg	M	3.14E-06	mg/kg-day	7.30E-02	1/(mg/kg-day)	2.29E-07
	Chrysene	1 18E+02	ug/kg	1 18E+02	ug/kg	M	4 16E-06	mg/kg-day	7 30E-03	1/(mg/kg-day)	3.03E-08
	Dibenz(a,h)anthracene	3.74E+00	ug/kg	3 74E+00	ug/kg	M	1.32E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	9.62E-07
	Indeno(1,2,3-cd)pyrene	1 01E+02	ug/kg	1 01E+02	ug/kg	M	3 56E-06	mg/kg-day	7.30E-01	1/(mg/kg-day)	2.60E-06
	Perylene	5.49E+00	ug/kg	5 49E+00	ug/kg	M	1.93E-07	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										5 28E-04
										Total of Routes	5.28E-04

TABLE 6-8.36
CALCULATION OF CANCER RISKS - LIFETIME RECREATIONAL PERSON INGESTION OF LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Medıum: Lobster
Exposure Medium Animal Tıssue
Exposure Point. Ingestion of Lobster
Receptor Population. Recreational Person
Receptor Age. Chıld/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	8 55E+00	mg/kg	8.55E+00	mg/kg	M	2.37E-05	mg/kg-day	1.50E+00	1/(mg/kg-day)	3 55E-05
	Cadmium	1 27E+01	mg/kg	1.27E+01	mg/kg	M	2.68E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 71E+01	mg/kg	1 71E+01	mg/kg	M	3.61E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	1 59E+01	mg/kg	1 59E+01	mg/kg	M	3 36E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	3 53E+00	mg/kg	3 53E+00	mg/kg	M	7.46E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	3.90E+01	mg/kg	3.90E+01	mg/kg	M	8.24E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	3 50E+00	mg/kg	3 50E+00	mg/kg	M	7.40E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	2 73E+02	mg/kg	2.73E+02	mg/kg	M	5 77E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	4 17E-01	ug/kg	4 17E-01	ug/kg	M	1 15E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 77E-10
	2,4'-DDT	6 26E-01	ug/kg	6.26E-01	ug/kg	M	1.73E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	5.89E-10
	4,4'-DDD	1 04E+00	ug/kg	1.04E+00	ug/kg	M	2 88E-09	mg/kg-day	2.40E-01	1/(mg/kg-day)	6 91E-10
	4,4'-DDE	1.30E+01	ug/kg	1.30E+01	ug/kg	M	3.60E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 22E-08
	4,4'-DDT	4.18E-01	ug/kg	4 18E-01	ug/kg	M	1 16E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	3.93E-10
	Dieldrin	4 47E+00	ug/kg	4 47E+00	ug/kg	M	1 24E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	1.98E-07
	Total PCB Congeners	2.65E+02	ug/kg	2 65E+02	ug/kg	M	7 33E-07	mg/kg-day	2.00E+00	1/(mg/kg-day)	1 47E-06
	1-Methylphenanthrene	3.14E+00	ug/kg	3 14E+00	ug/kg	M	6.64E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3.06E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 00E+00	ug/kg	2.00E+00	ug/kg	M	4.23E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	9.46E+01	ug/kg	9 46E+01	ug/kg	M	2.62E-07	mg/kg-day	7.30E-01	1/(mg/kg-day)	1.91E-07
	Benzo(a)pyrene	1 72E+02	ug/kg	1 72E+02	ug/kg	M	4.76E-07	mg/kg-day	7.30E+00	1/(mg/kg-day)	3 47E-06
	Benzo(b)fluoranthene	1 87E+02	ug/kg	1.87E+02	ug/kg	M	5.17E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 78E-07
	Benzo(e)pyrene	4.97E+01	ug/kg	4.97E+01	ug/kg	M	1.05E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	8.91E+01	ug/kg	8.91E+01	ug/kg	M	2 47E-07	mg/kg-day	7.30E-02	1/(mg/kg-day)	1 80E-08
	Chrysene	1.18E+02	ug/kg	1.18E+02	ug/kg	M	3.27E-07	mg/kg-day	7.30E-03	1/(mg/kg-day)	2.38E-09
	Dibenz(a,h)anthracene	3.74E+00	ug/kg	3 74E+00	ug/kg	M	1.03E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	7 55E-08
	Indeno(1,2,3-cd)pyrene	1.01E+02	ug/kg	1 01E+02	ug/kg	M	2.79E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 04E-07
	Perylene	5.49E+00	ug/kg	5.49E+00	ug/kg	M	1 16E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										4 15E-05
										Total of Routes	4 15E-05

TABLE 6-8.37
CALCULATION OF CANCER RISKS - ADULT SUBSISTENCE FISHERMAN INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	1 09E-03	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 63E-03
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	2 99E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	7 20E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	6 99E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	5 12E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	9 28E+01	mg/kg	9 28E+01	mg/kg	M	8 72E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	2 68E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	2 11E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	1 39E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	4 10E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	3 73E+00	mg/kg	3 73E+00	mg/kg	M	3 50E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	8 55E-03	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	1 38E-06	mg/kg-day	2 40E-01	1/(mg/kg-day)	3 31E-07
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	2 10E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	7 15E-08
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	2 25E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	5 39E-08
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	3 94E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 34E-07
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	3 35E-07	mg/kg-day	1 60E+01	1/(mg/kg-day)	5 37E-06
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	3 50E-05	mg/kg-day	2 00E+00	1/(mg/kg-day)	7 01E-05
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	3 12E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	1 13E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	2 10E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	1 39E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 01E-06
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	8 87E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 47E-06
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	1 42E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 04E-06
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	1 60E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	9 77E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	7 13E-08
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	1 80E-06	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 32E-08
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	1 36E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	9 94E-07
	Dibenzothiophene	2 63E+00	ug/kg	2 63E+00	ug/kg	M	2 47E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	9 06E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 62E-07
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	2 61E-07	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 72E-03
										Total of Routes	1 72E-03

TABLE 6-8.38
CALCULATION OF CANCER RISKS - LIFETIME RECREATIONAL PERSON INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	8 81E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 32E-04
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	1 79E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	4 32E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	4 19E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	3 07E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	9 28E+01	mg/kg	9 28E+01	mg/kg	M	5 23E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	1 61E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	1 27E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	8 34E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	2 46E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	3 73E+00	mg/kg	3 73E+00	mg/kg	M	2 10E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	5 13E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	1 12E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 68E-08
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	1 70E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	5 79E-09
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	1 82E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	4 36E-09
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	3 18E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 08E-08
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	2 71E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	4 34E-07
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	2 83E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	5 67E-06
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	1 87E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	6 76E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	1 26E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	1 12E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	8 21E-08
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	7 17E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	5 24E-07
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	1 15E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	8 37E-08
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	9 58E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	7 90E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	5 77E-09
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	1 46E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 06E-09
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	1 10E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	8 04E-08
	Dibenzothiophene	2 63E+00	ug/kg	2 63E+00	ug/kg	M	1 48E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	7 33E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	5 35E-08
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	1 57E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 39E-04
										Total of Routes	1 39E-04

TABLE 6-8.39
CALCULATION OF CANCER RISKS - CHILD RECREATIONAL PERSON INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Medium: Clams
Exposure Medium. Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	2 27E-05	mg/kg-day	1.50E+00	1/(mg/kg-day)	3 41E-05
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	6.24E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7.66E+00	mg/kg	M	1 50E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	1 46E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1.07E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	9.28E+01	mg/kg	9.28E+01	mg/kg	M	1.82E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2.85E+00	mg/kg	2 85E+00	mg/kg	M	5 59E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2.25E+01	mg/kg	M	4 41E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	2 90E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4.36E-01	mg/kg	4 36E-01	mg/kg	M	8 55E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	3 73E+00	mg/kg	3.73E+00	mg/kg	M	7.31E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	1 78E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1.47E+01	ug/kg	M	2.88E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	6.92E-09
	2,4'-DDT	2.24E+00	ug/kg	2 24E+00	ug/kg	M	4.39E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	1.49E-09
	4,4'-DDD	2 39E+00	ug/kg	2.39E+00	ug/kg	M	4 69E-09	mg/kg-day	2.40E-01	1/(mg/kg-day)	1.12E-09
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	8 22E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	2 79E-09
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	7.00E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	1.12E-07
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	7 31E-07	mg/kg-day	2.00E+00	1/(mg/kg-day)	1.46E-06
	1-Methylphenanthrene	3.32E+00	ug/kg	3.32E+00	ug/kg	M	6 51E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1.20E+00	ug/kg	M	2 35E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2.24E+00	ug/kg	2 24E+00	ug/kg	M	4 39E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1.48E+01	ug/kg	1 48E+01	ug/kg	M	2.90E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2.12E-08
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	1 85E-08	mg/kg-day	7.30E+00	1/(mg/kg-day)	1.35E-07
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1.51E+01	ug/kg	M	2.96E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2.16E-08
	Benzo(e)pyrene	1.70E+01	ug/kg	1.70E+01	ug/kg	M	3 33E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 04E-08	mg/kg-day	7.30E-02	1/(mg/kg-day)	1.49E-09
	Chrysene	1 92E+01	ug/kg	1.92E+01	ug/kg	M	3.76E-08	mg/kg-day	7.30E-03	1/(mg/kg-day)	2 75E-10
	Dibenz(a,h)anthracene	1.45E+00	ug/kg	1.45E+00	ug/kg	M	2.84E-09	mg/kg-day	7.30E+00	1/(mg/kg-day)	2.08E-08
	Dibenzothiophene	2.63E+00	ug/kg	2.63E+00	ug/kg	M	5.16E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9.65E+00	ug/kg	9.65E+00	ug/kg	M	1.89E-08	mg/kg-day	7.30E-01	1/(mg/kg-day)	1 38E-08
	Perylene	2 78E+00	ug/kg	2.78E+00	ug/kg	M	5.45E-09	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										3 59E-05
										Total of Routes	3 59E-05

TABLE 6-8.40
CALCULATION OF CANCER RISKS - ADULT RECREATIONAL PERSON INGESTION OF CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	6 54E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	9 81E-05
	Boron	3 18E+01	mg/kg	3 18E+01	mg/kg	M	1 79E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	4 32E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	7 44E+01	mg/kg	7 44E+01	mg/kg	M	4 19E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	3 07E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	9 28E+01	mg/kg	9 28E+01	mg/kg	M	5 23E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	1 61E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	1 27E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	1 48E+00	mg/kg	1 48E+00	mg/kg	M	8 34E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	2 46E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	3 73E+00	mg/kg	3 73E+00	mg/kg	M	2 10E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	5 13E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	8 28E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 99E-08
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	1 26E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	4 29E-09
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	1 35E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	3 23E-09
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	2 36E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	8 03E-09
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	2 01E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	3 22E-07
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	2 10E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	4 20E-06
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	1 87E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	6 76E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	1 26E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	8 34E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 09E-08
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	5 32E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 88E-07
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	8 51E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 21E-08
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	9 58E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	5 86E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	4 28E-09
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	1 08E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	7 90E-10
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	8 17E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	5 97E-08
	Dibenzothiophene	2 63E+00	ug/kg	2 63E+00	ug/kg	M	1 48E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	5 44E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 97E-08
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	1 57E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 03E-04
										Total of Routes	1 03E-04

TABLE 6-8.41
CALCULATION OF CANCER RISKS - ADULT SUBSISTENCE FISHERMAN INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Medium	Clams
Exposure Medium	Animal Tissue
Exposure Point	Ingestion of Clams
Receptor Population	Subsistence Fisherman
Receptor Age	Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	4 09E-04	mg/kg-day	1 50E+00	1/(mg/kg-day)	6 13E-04
	Boron	2 69E+01	mg/kg	2 69E+01	mg/kg	M	9 48E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	2 70E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 46E+01	mg/kg	1 46E+01	mg/kg	M	5 14E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 92E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 09E+01	mg/kg	4 09E+01	mg/kg	M	1 44E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	1 00E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	7 93E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	8 43E-01	mg/kg	8 43E-01	mg/kg	M	2 97E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	1 54E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	2 52E+00	mg/kg	2 52E+00	mg/kg	M	8 88E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	3 21E-03	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	5 18E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 24E-07
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	7 89E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	2 68E-08
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	8 42E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 02E-08
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	1 48E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	5 02E-08
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	1 26E-07	mg/kg-day	1 60E+01	1/(mg/kg-day)	2 01E-06
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	1 31E-05	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 63E-05
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	1 17E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	4 23E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	7 89E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	5 21E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 81E-07
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	3 33E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 43E-06
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	5 32E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 88E-07
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	5 99E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	3 66E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 67E-08
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	6 76E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	4 94E-09
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	5 11E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 73E-07
	Dibenzothiophene	1 90E+00	ug/kg	1 90E+00	ug/kg	M	6 69E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	3 40E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 48E-07
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	9 79E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										6 45E-04
										Total of Routes	6 45E-04

TABLE 6-8.42
CALCULATION OF CANCER RISKS - LIFETIME RECREATIONAL PERSON INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	3 21E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	4 81E-05
	Boron	2 69E+01	mg/kg	2 69E+01	mg/kg	M	5 69E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	1 62E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 46E+01	mg/kg	1 46E+01	mg/kg	M	3 09E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 15E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 09E+01	mg/kg	4 09E+01	mg/kg	M	8 64E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	6 02E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	4 76E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	8 43E-01	mg/kg	8 43E-01	mg/kg	M	1 78E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	9 21E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	2 52E+00	mg/kg	2 52E+00	mg/kg	M	5 33E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	1 92E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	4 07E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	9 76E-09
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	6 20E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	2 11E-09
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	6 61E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 59E-09
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	1 16E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	3 94E-09
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	9 88E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	1 58E-07
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	1 03E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	2 06E-06
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	7 02E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	2 54E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	4 73E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	4 10E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 99E-08
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	2 61E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 91E-07
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	4 18E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 05E-08
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	3 59E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 88E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 10E-09
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	5 31E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	3 88E-10
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	4 01E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 93E-08
	Dibenzothiophene	1 90E+00	ug/kg	1 90E+00	ug/kg	M	4 02E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	2 67E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 95E-08
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	5 88E-09	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										5 07E-05
										Total of Routes	5 07E-05

TABLE 6-8.43
CALCULATION OF CANCER RISKS - CHILD RECREATIONAL PERSON INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	7 58E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 14E-05
	Boron	2 69E+01	mg/kg	2 69E+01	mg/kg	M	1 76E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	5 01E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 46E+01	mg/kg	1 46E+01	mg/kg	M	9 54E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	3 56E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 09E+01	mg/kg	4 09E+01	mg/kg	M	2 67E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	1 86E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	1 47E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	8 43E-01	mg/kg	8 43E-01	mg/kg	M	5 51E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	2 85E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	2 52E+00	mg/kg	2 52E+00	mg/kg	M	1 65E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	5 95E-05	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	9 61E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 31E-09
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	1 46E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	4 98E-10
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	1 56E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	3 75E-10
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	2 74E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	9 31E-10
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	2 33E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	3 73E-08
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	2 44E-07	mg/kg-day	2 00E+00	1/(mg/kg-day)	4 88E-07
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	2 17E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	7 84E-10	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	1 46E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	9 67E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 06E-09
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	6 17E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	4 50E-08
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	9 87E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 20E-09
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	1 11E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	6 80E-09	mg/kg-day	7 30E-02	1/(mg/kg-day)	4 96E-10
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	1 25E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	9 16E-11
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	9 48E-10	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 92E-09
	Dibenzothiophene	1 90E+00	ug/kg	1 90E+00	ug/kg	M	1 24E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	6 31E-09	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 60E-09
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	1 82E-09	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 20E-05
										Total of Routes	1 20E-05

TABLE 6-8.44
CALCULATION OF CANCER RISKS - ADULT RECREATIONAL PERSON INGESTION OF CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Clams
Exposure Medium Animal Tissue
Exposure Point Ingestion of Clams
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	1 16E+01	mg/kg	1 16E+01	mg/kg	M	2 45E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	3 68E-05
	Boron	2 69E+01	mg/kg	2 69E+01	mg/kg	M	5 69E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Cadmium	7 66E+00	mg/kg	7 66E+00	mg/kg	M	1 62E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 46E+01	mg/kg	1 46E+01	mg/kg	M	3 09E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	5 45E+00	mg/kg	5 45E+00	mg/kg	M	1 15E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Manganese	4 09E+01	mg/kg	4 09E+01	mg/kg	M	8 64E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 85E+00	mg/kg	2 85E+00	mg/kg	M	6 02E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	2 25E+01	mg/kg	2 25E+01	mg/kg	M	4 76E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Selenium	8 43E-01	mg/kg	8 43E-01	mg/kg	M	1 78E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Silver	4 36E-01	mg/kg	4 36E-01	mg/kg	M	9 21E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Vanadium	2 52E+00	mg/kg	2 52E+00	mg/kg	M	5 33E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	9 10E+01	mg/kg	9 10E+01	mg/kg	M	1 92E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	1 47E+01	ug/kg	1 47E+01	ug/kg	M	3 11E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	7 46E-09
	2,4'-DDT	2 24E+00	ug/kg	2 24E+00	ug/kg	M	4 73E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 61E-09
	4,4'-DDD	2 39E+00	ug/kg	2 39E+00	ug/kg	M	5 05E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 21E-09
	4,4'-DDE	4 19E+00	ug/kg	4 19E+00	ug/kg	M	8 86E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	3 01E-09
	Dieldrin	3 57E+00	ug/kg	3 57E+00	ug/kg	M	7 55E-09	mg/kg-day	1 60E+01	1/(mg/kg-day)	1 21E-07
	Total PCB Congeners	3 73E+02	ug/kg	3 73E+02	ug/kg	M	7 88E-07	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 58E-06
	1-Methylphenanthrene	3 32E+00	ug/kg	3 32E+00	ug/kg	M	7 02E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	1 20E+00	ug/kg	1 20E+00	ug/kg	M	2 54E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	2 24E+00	ug/kg	2 24E+00	ug/kg	M	4 73E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 48E+01	ug/kg	1 48E+01	ug/kg	M	3 13E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 28E-08
	Benzo(a)pyrene	9 44E+00	ug/kg	9 44E+00	ug/kg	M	2 00E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 46E-07
	Benzo(b)fluoranthene	1 51E+01	ug/kg	1 51E+01	ug/kg	M	3 19E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 33E-08
	Benzo(e)pyrene	1 70E+01	ug/kg	1 70E+01	ug/kg	M	3 59E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 04E+01	ug/kg	1 04E+01	ug/kg	M	2 20E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 60E-09
	Chrysene	1 92E+01	ug/kg	1 92E+01	ug/kg	M	4 06E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 96E-10
	Dibenz(a,h)anthracene	1 45E+00	ug/kg	1 45E+00	ug/kg	M	3 06E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 24E-08
	Dibenzothiophene	1 90E+00	ug/kg	1 90E+00	ug/kg	M	4 02E-09	mg/kg-day	--	1/(mg/kg-day)	--
	Indeno(1,2,3-cd)pyrene	9 65E+00	ug/kg	9 65E+00	ug/kg	M	2 04E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 49E-08
	Perylene	2 78E+00	ug/kg	2 78E+00	ug/kg	M	5 88E-09	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										3 87E-05
										Total of Routes	3 87E-05

TABLE 6-8.45
CALCULATION OF CANCER RISKS - ADULT SUBSISTENCE FISHERMAN INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	2 15E-04	mg/kg-day	1 50E+00	1/(mg/kg-day)	3 23E-04
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	1 44E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	3 80E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	4 34E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	2 55E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	1 01E-03	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	1 41E-02	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	3 30E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	7 91E-08
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	2 53E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	8 59E-08
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	8 50E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 04E-07
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	1 70E-06	mg/kg-day	3 40E-01	1/(mg/kg-day)	5 78E-07
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	4 41E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 50E-07
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	4 63E-07	mg/kg-day	3 50E-01	1/(mg/kg-day)	1 62E-07
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	5 42E-07	mg/kg-day	1 60E+01	1/(mg/kg-day)	8 67E-06
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	4 49E-08	mg/kg-day	9 10E+00	1/(mg/kg-day)	4 09E-07
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	4 62E-05	mg/kg-day	2 00E+00	1/(mg/kg-day)	9 24E-05
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	3 84E-07	mg/kg-day	3 50E-01	1/(mg/kg-day)	1 34E-07
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	4 72E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	3 48E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	5 74E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	1 49E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 09E-06
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	8 97E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 55E-06
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	1 77E-06	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 29E-06
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	3 25E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	1 85E-06	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 35E-07
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	3 46E-06	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 52E-08
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	1 45E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 06E-06
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	9 12E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 66E-07
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	1 24E-06	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										4 36E-04
										Total of Routes	4 36E-04

TABLE 6-8.46
CALCULATION OF CANCER RISKS - LIFETIME RECREATIONAL PERSON INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Recreational Person
Receptor Age Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	1 74E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	2 61E-05
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	8 62E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	2 28E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	2 60E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	1 53E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	6 03E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	8 45E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	2 67E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	6 40E-09
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	2 04E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	6 95E-09
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	6 88E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 65E-08
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	1 38E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	4 68E-08
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	3 57E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 21E-08
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	3 75E-08	mg/kg-day	3 50E-01	1/(mg/kg-day)	1 31E-08
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	4 38E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	7 01E-07
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	3 63E-09	mg/kg-day	9 10E+00	1/(mg/kg-day)	3 30E-08
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	3 74E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	7 48E-06
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	3 11E-08	mg/kg-day	3 50E-01	1/(mg/kg-day)	1 09E-08
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	2 83E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	2 09E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	3 44E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	1 21E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	8 82E-08
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	7 25E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	5 30E-07
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	1 43E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 04E-07
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	1 95E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	1 50E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	1 09E-08
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	2 80E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	2 04E-09
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	1 17E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	8 54E-08
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	7 38E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	5 38E-08
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	7 44E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										3 53E-05
										Total of Routes	3 53E-05

TABLE 6-8.47
CALCULATION OF CANCER RISKS - CHILD RECREATIONAL PERSON INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Recreational Person
Receptor Age Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	4 49E-06	mg/kg-day	1 50E+00	1/(mg/kg-day)	6 74E-06
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	3 00E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	7 94E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	9 06E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	5 33E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	2 10E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	2 94E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	6 88E-09	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 65E-09
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	5 27E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 79E-09
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	1 77E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	4 26E-09
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	3 55E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	1 21E-08
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	9 22E-09	mg/kg-day	3 40E-01	1/(mg/kg-day)	3 13E-09
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	9 67E-09	mg/kg-day	3 50E-01	1/(mg/kg-day)	3 38E-09
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	1 13E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	1 81E-07
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	9 37E-10	mg/kg-day	9 10E+00	1/(mg/kg-day)	8 53E-09
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	9 65E-07	mg/kg-day	2 00E+00	1/(mg/kg-day)	1 93E-06
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	8 02E-09	mg/kg-day	3 50E-01	1/(mg/kg-day)	2 81E-09
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	9 86E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	7 25E-09	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	1 20E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	3 12E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 28E-08
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	1 87E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	1 37E-07
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	3 69E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 69E-08
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	6 78E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	3 86E-08	mg/kg-day	7 30E-02	1/(mg/kg-day)	2 82E-09
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	7 22E-08	mg/kg-day	7 30E-03	1/(mg/kg-day)	5 27E-10
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	3 02E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 20E-08
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	1 90E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	1 39E-08
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	2 59E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										9 11E-06
										Total of Routes	9 11E-06

TABLE 6-8.48
CALCULATION OF CANCER RISKS - ADULT RECREATIONAL PERSON INGESTION OF BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Recreational Person
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	1 29E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 94E-05
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	8 62E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	4 05E+01	mg/kg	4 05E+01	mg/kg	M	2 28E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	2 60E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	1 53E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	6 03E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	8 45E-04	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	1 98E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	4 75E-09
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	1 52E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	5 15E-09
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	5 10E-08	mg/kg-day	2 40E-01	1/(mg/kg-day)	1 22E-08
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	1 02E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	3 47E-08
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	2 65E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	9 01E-09
	Alpha-Chlordane	4 93E+00	ug/kg	4 93E+00	ug/kg	M	2 78E-08	mg/kg-day	3 50E-01	1/(mg/kg-day)	9 72E-09
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	3 25E-08	mg/kg-day	1 60E+01	1/(mg/kg-day)	5 20E-07
	Heptachlor Epoxide	4 78E-01	ug/kg	4 78E-01	ug/kg	M	2 69E-09	mg/kg-day	9 10E+00	1/(mg/kg-day)	2 45E-08
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	2 77E-06	mg/kg-day	2 00E+00	1/(mg/kg-day)	5 55E-06
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	2 31E-08	mg/kg-day	3 50E-01	1/(mg/kg-day)	8 07E-09
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	2 83E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	2 09E-08	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	3 44E-08	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	8 96E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	6 54E-08
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	5 38E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 93E-07
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	1 06E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	7 73E-08
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	1 95E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	1 11E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	8 11E-09
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	2 07E-07	mg/kg-day	7 30E-03	1/(mg/kg-day)	1 51E-09
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	8 68E-09	mg/kg-day	7 30E+00	1/(mg/kg-day)	6 34E-08
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	5 47E-08	mg/kg-day	7 30E-01	1/(mg/kg-day)	3 99E-08
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	7 44E-08	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										2 62E-05
										Total of Routes	2 62E-05

TABLE 6-8.49
CALCULATION OF CANCER RISKS - ADULT SUBSISTENCE FISHERMAN INGESTION OF BLUE MUSSELS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Medium Blue Mussels
Exposure Medium Animal Tissue
Exposure Point Ingestion of Blue Mussels
Receptor Population Subsistence Fisherman
Receptor Age Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Arsenic	2 29E+00	mg/kg	2 29E+00	mg/kg	M	8 07E-05	mg/kg-day	1 50E+00	1/(mg/kg-day)	1 21E-04
	Cadmium	1 53E+01	mg/kg	1 53E+01	mg/kg	M	5 39E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Chromium	1 24E+01	mg/kg	1 24E+01	mg/kg	M	4 37E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Lead	4 62E+00	mg/kg	4 62E+00	mg/kg	M	1 63E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Mercury	2 72E+00	mg/kg	2 72E+00	mg/kg	M	9 58E-05	mg/kg-day	--	1/(mg/kg-day)	--
	Nickel	1 07E+01	mg/kg	1 07E+01	mg/kg	M	3 77E-04	mg/kg-day	--	1/(mg/kg-day)	--
	Zinc	1 50E+02	mg/kg	1 50E+02	mg/kg	M	5 28E-03	mg/kg-day	--	1/(mg/kg-day)	--
	2,4'-DDD	3 51E+00	ug/kg	3 51E+00	ug/kg	M	1 24E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	2 97E-08
	2,4'-DDT	2 69E+00	ug/kg	2 69E+00	ug/kg	M	9 48E-08	mg/kg-day	3 40E-01	1/(mg/kg-day)	3 22E-08
	4,4'-DDD	9 05E+00	ug/kg	9 05E+00	ug/kg	M	3 19E-07	mg/kg-day	2 40E-01	1/(mg/kg-day)	7 65E-08
	4,4'-DDE	1 81E+01	ug/kg	1 81E+01	ug/kg	M	6 38E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	2 17E-07
	4,4'-DDT	4 70E+00	ug/kg	4 70E+00	ug/kg	M	1 66E-07	mg/kg-day	3 40E-01	1/(mg/kg-day)	5 63E-08
	Alpha-Chlordane	3 94E+00	ug/kg	3 94E+00	ug/kg	M	1 39E-07	mg/kg-day	3 50E-01	1/(mg/kg-day)	4 86E-08
	Dieldrin	5 77E+00	ug/kg	5 77E+00	ug/kg	M	2 03E-07	mg/kg-day	1 60E+01	1/(mg/kg-day)	3 25E-06
	Heptachlor Epoxide	2 23E-01	ug/kg	2 23E-01	ug/kg	M	7 86E-09	mg/kg-day	9 10E+00	1/(mg/kg-day)	7 15E-08
	Total PCB Congeners	4 92E+02	ug/kg	4 92E+02	ug/kg	M	1 73E-05	mg/kg-day	2 00E+00	1/(mg/kg-day)	3 47E-05
	trans-Nonachlor	4 09E+00	ug/kg	4 09E+00	ug/kg	M	1 44E-07	mg/kg-day	3 50E-01	1/(mg/kg-day)	5 04E-08
	1-Methylphenanthrene	5 03E+00	ug/kg	5 03E+00	ug/kg	M	1 77E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,3,5-Trimethylnaphthalene	3 70E+00	ug/kg	3 70E+00	ug/kg	M	1 30E-07	mg/kg-day	--	1/(mg/kg-day)	--
	2,6-Dimethylnaphthalene	6 11E+00	ug/kg	6 11E+00	ug/kg	M	2 15E-07	mg/kg-day	--	1/(mg/kg-day)	--
	Benz(a)anthracene	1 59E+01	ug/kg	1 59E+01	ug/kg	M	5 60E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 09E-07
	Benzo(a)pyrene	9 55E+00	ug/kg	9 55E+00	ug/kg	M	3 36E-07	mg/kg-day	7 30E+00	1/(mg/kg-day)	2 46E-06
	Benzo(b)fluoranthene	1 88E+01	ug/kg	1 88E+01	ug/kg	M	6 62E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	4 83E-07
	Benzo(e)pyrene	3 46E+01	ug/kg	3 46E+01	ug/kg	M	1 22E-06	mg/kg-day	--	1/(mg/kg-day)	--
	Benzo(k)fluoranthene	1 97E+01	ug/kg	1 97E+01	ug/kg	M	6 94E-07	mg/kg-day	7 30E-02	1/(mg/kg-day)	5 07E-08
	Chrysene	3 68E+01	ug/kg	3 68E+01	ug/kg	M	1 30E-06	mg/kg-day	7 30E-03	1/(mg/kg-day)	9 46E-09
	Dibenz(a,h)anthracene	1 54E+00	ug/kg	1 54E+00	ug/kg	M	5 42E-08	mg/kg-day	7 30E+00	1/(mg/kg-day)	3 96E-07
	Indeno(1,2,3-cd)pyrene	9 71E+00	ug/kg	9 71E+00	ug/kg	M	3 42E-07	mg/kg-day	7 30E-01	1/(mg/kg-day)	2 50E-07
	Perylene	1 32E+01	ug/kg	1 32E+01	ug/kg	M	4 65E-07	mg/kg-day	--	1/(mg/kg-day)	--
	(Total)										1 64E-04
										Total of Routes	1 64E-04

TABLE 6-9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RESIDENT EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils											
			Total 2,3,7,8-TCDD Equiv	1 80E-06	--	2 13E-07	2 01E-06	Total 2,3,7,8-TCDD Equiv	N/A	N/A	--	N/A	--
			Arsenic	9 55E-06	--	1 13E-06	1 07E-05	Arsenic	N/A	N/A	--	N/A	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	N/A	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	N/A	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	N/A	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	N/A	--
			Aroclor-1254	7 43E-08	--	4 09E-08	1 15E-07	Aroclor-1254	N/A	N/A	--	N/A	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	N/A	--	N/A	--
			Benz(a)anthracene	4 09E-07	--	2 09E-07	6 18E-07	Benz(a)anthracene	N/A	N/A	--	N/A	--
			Benzo(a)pyrene	4 04E-06	--	2 07E-06	6 11E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	--
			Benzo(b)fluoranthene	4 67E-07	--	2 39E-07	7 06E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	--
			Benzo(k)fluoranthene	2 46E-08	--	1 26E-08	3 72E-08	Benzo(k)fluoranthene	N/A	N/A	--	N/A	--
			Carbazole	6 37E-09	--	3 26E-09	9 63E-09	Carbazole	N/A	N/A	--	N/A	--
			Chrysene	3 90E-09	--	1 99E-09	5 89E-09	Chrysene	N/A	N/A	--	N/A	--
			Dibenz(a,h)anthracene	2 64E-06	--	1 35E-06	3 99E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	--
			Indeno(1,2,3-cd)pyrene	2 69E-07	--	1 38E-07	4 07E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	--
			(Total)	1 93E-05	--	5 40E-06	2 47E-05	(Total)		--	--	--	--
	Particulates	Particulate Dust Inhalation from Surface Soils											
			Total 2,3,7,8-TCDD Equiv	--	3 02E-10	--	3 02E-10	Total 2,3,7,8-TCDD Equiv	N/A	--	N/A	--	--
			Arsenic	--	1 61E-08	--	1 61E-08	Arsenic	N/A	--	N/A	--	--
			Chromium	--	9 84E-08	--	9 84E-08	Chromium	N/A	--	N/A	--	--
			Lead	--	--	--	--	Lead	N/A	--	N/A	--	--
			Manganese	--	--	--	--	Manganese	N/A	--	N/A	--	--
			Nickel	--	--	--	--	Nickel	N/A	--	N/A	--	--
			Aroclor-1254	--	1 24E-11	--	1 24E-11	Aroclor-1254	N/A	--	N/A	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	N/A	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	N/A	--	--
			Benzo(a)pyrene	--	2 88E-10	--	2 88E-10	Benzo(a)pyrene	N/A	--	N/A	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	N/A	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	N/A	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	N/A	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	N/A	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	N/A	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	N/A	--	--
			(Total)	--	1 15E-07	--	1 15E-07	(Total)		--	--	--	--
						Total Risk Across Surface Soils	2 48E-05					Total Hazard Index Across Surface Soils	--

TABLE 6-9.2
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RESIDENT EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils	Total 2,3,7,8-TCDD Equiv	1 22E-06	--	1 15E-07	1 34E-06	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	6 48E-06	--	6 11E-07	7 09E-06	Arsenic	Skin	1 68E-01	--	1 58E-02	1 84E-01
			Chromium	--	--	--	--	Chromium	Kidney	3 78E-02	--	NA	3 78E-02
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	3 19E-02	--	NA	3 19E-02
			Nickel	--	--	--	--	Nickel	Decr Org Wt	6 89E-03	--	NA	6 89E-03
			Aroclor-1254	5 04E-08	--	2 22E-08	7 26E-08	Aroclor-1254	Skin/Eye	1 47E-02	--	6 47E-03	2 12E-02
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	2 77E-07	--	1 13E-07	3 90E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	2 74E-06	--	1 12E-06	3 86E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	3 17E-07	--	1 29E-07	4 46E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 67E-08	--	6 83E-09	2 35E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	4 32E-09	--	1 76E-09	6 08E-09	Carbazole	N/A	--	--	--	--
			Chrysene	2 64E-09	--	1 08E-09	3 72E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1 79E-06	--	7 31E-07	2 52E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 82E-07	--	7 45E-08	2 57E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	1 31E-05	--	2 93E-06	1 60E-05	(Total)		2 59E-01	--	2 23E-02	2 82E-01
	Particulates	Particulate Dust Inhalation from Surface Soils	Total 2,3,7,8-TCDD Equiv	--	1 33E-10	--	1 33E-10	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	--	7 11E-09	--	7 11E-09	Arsenic	N/A	--	--	--	--
			Chromium	--	4 34E-08	--	4 34E-08	Chromium	Lung	--	4 32E-04	--	4 32E-04
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	1 75E-02	--	1 75E-02
			Nickel	--	--	--	--	Nickel	N/A	--	--	--	--
			Aroclor-1254	--	5 50E-12	--	5 50E-12	Aroclor-1254	N/A	--	--	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	1 27E-10	--	1 27E-10	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	5 08E-08	--	5 08E-08	(Total)		--	1 80E-02	--	1 80E-02
						Total Risk Across Surface Soils	1 61E-05					Total Hazard Index Across Surface Soils	2 99E-01

TABLE 6-9.3
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RESIDENT EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils											
			Total 2,3,7,8-TCDD Equiv	5 80E-07	--	9 76E-08	6 77E-07	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	3 07E-06	--	5 17E-07	3 59E-06	Arsenic	Skin	1 99E-02	--	3 35E-03	2 33E-02
			Chromium	--	--	--	--	Chromium	Kidney	4 48E-03	--	NA	4 48E-03
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	3 78E-03	--	NA	3 78E-03
			Nickel	--	--	--	--	Nickel	Decr Org Wt	8 17E-04	--	NA	8 17E-04
			Aroclor-1254	2 39E-08	--	1 88E-08	4 27E-08	Aroclor-1254	Skin/Eye	1 74E-03	--	1 37E-03	3 11E-03
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	1 31E-07	--	9 59E-08	2 27E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 30E-06	--	9 48E-07	2 25E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 50E-07	--	1 10E-07	2 60E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	7 92E-09	--	5 78E-09	1 37E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	2 05E-09	--	1 49E-09	3 54E-09	Carbazole	N/A	--	--	--	--
			Chrysene	1 25E-09	--	9 14E-10	2 17E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	8 49E-07	--	6 19E-07	1 47E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	8 65E-08	--	6 31E-08	1 50E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	6 20E-06	--	2 48E-06	8 68E-06	(Total)		3 07E-02	--	4 72E-03	3 55E-02
	Particulates	Particulate Dust Inhalation from Surface Soils											
			Total 2,3,7,8-TCDD Equiv	--	1 69E-10	--	1 69E-10	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	--	9 00E-09	--	9 00E-09	Arsenic	N/A	--	--	--	--
			Chromium	--	5 49E-08	--	5 49E-08	Chromium	Lung	--	1 37E-04	--	1 37E-04
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	5 54E-03	--	5 54E-03
			Nickel	--	--	--	--	Nickel	N/A	--	--	--	--
			Aroclor-1254	--	6 95E-12	--	6 95E-12	Aroclor-1254	N/A	--	--	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	1 61E-10	--	1 61E-10	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	6 43E-08	--	6 43E-08	(Total)		--	5 68E-03	--	5 68E-03
						Total Risk Across Surface Soils	8 75E-06					Total Hazard Index Across Surface Soils	4 11E-02

TABLE 6-9.4
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RECREATIONAL PERSON EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils	Total 2,3,7,8-TCDD Equiv	3 43E-07	--	6 78E-08	4 11E-07	Total 2,3,7,8-TCDD Equiv	N/A	N/A	--	N/A	--
			Arsenic	1 82E-06	--	3 59E-07	2 18E-06	Arsenic	N/A	N/A	--	N/A	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	N/A	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	N/A	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	N/A	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	N/A	--
			Aroclor-1254	1 41E-08	--	1 30E-08	2 72E-08	Aroclor-1254	N/A	N/A	--	N/A	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	N/A	--	N/A	--
			Benz(a)anthracene	7 78E-08	--	6 66E-08	1 44E-07	Benz(a)anthracene	N/A	N/A	--	N/A	--
			Benzo(a)pyrene	7 69E-07	--	6 58E-07	1 43E-06	Benzo(a)pyrene	N/A	N/A	--	N/A	--
			Benzo(b)fluoranthene	8 89E-08	--	7 61E-08	1 65E-07	Benzo(b)fluoranthene	N/A	N/A	--	N/A	--
			Benzo(k)fluoranthene	4 69E-09	--	4 01E-09	8 70E-09	Benzo(k)fluoranthene	N/A	N/A	--	N/A	--
			Carbazole	1 21E-09	--	1 04E-09	2 25E-09	Carbazole	N/A	N/A	--	N/A	--
			Chrysene	7 41E-10	--	6 35E-10	1 38E-09	Chrysene	N/A	N/A	--	N/A	--
			Dibenz(a,h)anthracene	5 02E-07	--	4 30E-07	9 32E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	--
			Indeno(1,2,3-cd)pyrene	5 12E-08	--	4 38E-08	9 50E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	--
			(Total)	3 67E-06	--	1 72E-06	5 39E-06	(Total)		--	--	--	--
	Particulates	Particulate Dust Inhalation from Surface Soils	Total 2,3,7,8-TCDD Equiv	--	1 57E-11	--	1 57E-11	Total 2,3,7,8-TCDD Equiv	N/A	--	N/A	--	--
			Arsenic	--	8 39E-10	--	8 39E-10	Arsenic	N/A	--	N/A	--	--
			Chromium	--	5 12E-09	--	5 12E-09	Chromium	N/A	--	N/A	--	--
			Lead	--	--	--	--	Lead	N/A	--	N/A	--	--
			Manganese	--	--	--	--	Manganese	N/A	--	N/A	--	--
			Nickel	--	--	--	--	Nickel	N/A	--	N/A	--	--
			Aroclor-1254	--	6 48E-13	--	6 48E-13	Aroclor-1254	N/A	--	N/A	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	N/A	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	N/A	--	--
			Benzo(a)pyrene	--	1 50E-11	--	1 50E-11	Benzo(a)pyrene	N/A	--	N/A	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	N/A	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	N/A	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	N/A	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	N/A	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	N/A	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	N/A	--	--
			(Total)	--	5 99E-09	--	5 99E-09	(Total)		--	--	--	--
						Total Risk Across Surface Soils	5 40E-06					Total Hazard Index Across Surface Soils	--

TABLE 6-9.5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD (AGE 1-4) RECREATIONAL PERSON EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Current/Future
Receptor Population	Recreational Person
Receptor Age	Child (Age 1-4)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils											
			Total 2,3,7,8-TCDD Equiv	1 89E-07	--	1 64E-08	2 06E-07	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	1 00E-06	--	8 68E-08	1 09E-06	Arsenic	Skin	3 90E-02	--	3 37E-03	4 24E-02
			Chromium	--	--	--	--	Chromium	Kidney	8 77E-03	--	NA	8 77E-03
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	7 41E-03	--	NA	7 41E-03
			Nickel	--	--	--	--	Nickel	Decr Org Wt	1 60E-03	--	NA	1 60E-03
			Aroclor-1254	7 80E-09	--	3 15E-09	1 09E-08	Aroclor-1254	Skin/Eye	3 41E-03	--	1 38E-03	4 79E-03
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	4 29E-08	--	1 61E-08	5 90E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	4 24E-07	--	1 59E-07	5 83E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	4 90E-08	--	1 84E-08	6 74E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	2 59E-09	--	9 70E-10	3 56E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	6 68E-10	--	2 51E-10	9 19E-10	Carbazole	N/A	--	--	--	--
			Chrysene	4 09E-10	--	1 53E-10	5 62E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 77E-07	--	1 04E-07	3 81E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 82E-08	--	1 06E-08	3 88E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	2 02E-06	--	4 16E-07	2 44E-06	(Total)		6 02E-02	--	4 75E-03	6 49E-02
	Particulates	Particulate Dust Inhalation from Surface Soils											
			Total 2,3,7,8-TCDD Equiv	--	4 30E-12	--	4 30E-12	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	--	2 29E-10	--	2 29E-10	Arsenic	N/A	--	--	--	--
			Chromium	--	1 40E-09	--	1 40E-09	Chromium	Lung	--	2 09E-05	--	2 09E-05
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	8 48E-04	--	8 48E-04
			Nickel	--	--	--	--	Nickel	N/A	--	--	--	--
			Aroclor-1254	--	1 77E-13	--	1 77E-13	Aroclor-1254	N/A	--	--	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	4 09E-12	--	4 09E-12	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	1 64E-09	--	1 64E-09	(Total)		--	8 69E-04	--	8 69E-04
						Total Risk Across Surface Soils	2 44E-06					Total Hazard Index Across Surface Soils	6 58E-02

TABLE 6-9.6
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - YOUTH (AGE 5-12) RECREATIONAL PERSON EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Current/Future
Receptor Population	Recreational Person
Receptor Age	Youth (Age 5-12)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils											
			Total 2,3,7,8-TCDD Equiv	1 02E-07	--	3 67E-08	1 38E-07	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	5 39E-07	--	1 95E-07	7 33E-07	Arsenic	Skin	1 05E-02	--	3 79E-03	1 43E-02
			Chromium	--	--	--	--	Chromium	Kidney	2 35E-03	--	NA	2 35E-03
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	1 99E-03	--	NA	1 99E-03
			Nickel	--	--	--	--	Nickel	Decr Org Wt	4 30E-04	--	NA	4 30E-04
			Aroclor-1254	4 19E-09	--	7 07E-09	1 13E-08	Aroclor-1254	Skin/Eye	9 16E-04	--	1 55E-03	2 46E-03
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	2 30E-08	--	3 61E-08	5 91E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	2 28E-07	--	3 57E-07	5 85E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 63E-08	--	4 13E-08	6 76E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 39E-09	--	2 18E-09	3 56E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	3 59E-10	--	5 63E-10	9 22E-10	Carbazole	N/A	--	--	--	--
			Chrysene	2 20E-10	--	3 44E-10	5 64E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1 49E-07	--	2 33E-07	3 82E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 52E-08	--	2 38E-08	3 89E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	1 09E-06	--	9 33E-07	2 02E-06	(Total)		1 62E-02	--	5 33E-03	2 15E-02
	Particulates	Particulate Dust Inhalation from Surface Soils											
			Total 2,3,7,8-TCDD Equiv	--	6 16E-12	--	6 16E-12	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	--	3 29E-10	--	3 29E-10	Arsenic	N/A	--	--	--	--
			Chromium	--	2 01E-09	--	2 01E-09	Chromium	Lung	--	1 50E-05	--	1 50E-05
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	6 07E-04	--	6 07E-04
			Nickel	--	--	--	--	Nickel	N/A	--	--	--	--
			Aroclor-1254	--	2 54E-13	--	2 54E-13	Aroclor-1254	N/A	--	--	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	5 87E-12	--	5 87E-12	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	2 35E-09	--	2 35E-09	(Total)		--	6 22E-04	--	6 22E-04
						Total Risk Across Surface Soils	2 02E-06					Total Hazard Index Across Surface Soils	2 21E-02

TABLE 6-9.7
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL PERSON EXPOSURE TO SURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Current/Future
Receptor Population	Recreational Person
Receptor Age	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soils	Surface Soils	Contact with Surface Soils											
			Total 2,3,7,8-TCDD Equiv	5 22E-08	--	1 46E-08	6 68E-08	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	2 77E-07	--	7 76E-08	3 54E-07	Arsenic	Skin	2 39E-03	--	6 70E-04	3 06E-03
			Chromium	--	--	--	--	Chromium	Kidney	5 37E-04	--	NA	5 37E-04
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	4 54E-04	--	NA	4 54E-04
			Nickel	--	--	--	--	Nickel	Decr Org Wt	9 81E-05	--	NA	9 81E-05
			Aroclor-1254	2 15E-09	--	2 82E-09	4 97E-09	Aroclor-1254	Skin/Eye	2 09E-04	--	2 74E-04	4 83E-04
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	1 18E-08	--	1 44E-08	2 62E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 17E-07	--	1 42E-07	2 59E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 35E-08	--	1 64E-08	3 00E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	7 13E-10	--	8 67E-10	1 58E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	1 84E-10	--	2 24E-10	4 08E-10	Carbazole	N/A	--	--	--	--
			Chrysene	1 13E-10	--	1 37E-10	2 50E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	7 64E-08	--	9 29E-08	1 69E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	7 79E-09	--	9 47E-09	1 73E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	5 58E-07	--	3 72E-07	9 30E-07	(Total)		3 69E-03	--	9 44E-04	4 63E-03
	Particulates	Particulate Dust Inhalation from Surface Soils											
			Total 2,3,7,8-TCDD Equiv	--	5 27E-12	--	5 27E-12	Total 2,3,7,8-TCDD Equiv	N/A	--	--	--	--
			Arsenic	--	2 81E-10	--	2 81E-10	Arsenic	N/A	--	--	--	--
			Chromium	--	1 72E-09	--	1 72E-09	Chromium	Lung	--	5 69E-06	--	5 69E-06
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	2 31E-04	--	2 31E-04
			Nickel	--	--	--	--	Nickel	N/A	--	--	--	--
			Aroclor-1254	--	2 17E-13	--	2 17E-13	Aroclor-1254	N/A	--	--	--	--
			4-Chloro-3-methylphenol	--	--	--	--	4-Chloro-3-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	5 02E-12	--	5 02E-12	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	2 01E-09	--	2 01E-09	(Total)		--	2 37E-04	--	2 37E-04
						Total Risk Across Surface Soils	9 32E-07					Total Hazard Index Across Surface Soils	4 87E-03

TABLE 6-9.8
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RESIDENT EXPOSURE TO SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soils	Subsurface	Contact with Subsurface Soils	Antimony	--	--	--	--	Antimony	N/A	N/A	--	N/A	--
			Arsenic	1 52E-05	--	1 79E-06	1 70E-05	Arsenic	N/A	N/A	--	N/A	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	N/A	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	N/A	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	N/A	--
			Mercury	--	--	--	--	Mercury	N/A	N/A	--	N/A	--
			Vanadium	--	--	--	--	Vanadium	N/A	N/A	--	N/A	--
			Zinc	--	--	--	--	Zinc	N/A	N/A	--	N/A	--
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	N/A	--	N/A	--
			Dieldrin	1 12E-07	--	--	1 12E-07	Dieldrin	N/A	N/A	--	N/A	--
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	N/A	--	N/A	--
			Benz(a)anthracene	8 99E-07	--	4 60E-07	1 36E-06	Benz(a)anthracene	N/A	N/A	--	N/A	--
			Benzo(a)pyrene	8 84E-06	--	4 53E-06	1 34E-05	Benzo(a)pyrene	N/A	N/A	--	N/A	--
			Benzo(b)fluoranthene	7 89E-07	--	4 04E-07	1 19E-06	Benzo(b)fluoranthene	N/A	N/A	--	N/A	--
			Benzo(k)fluoranthene	5 14E-08	--	2 63E-08	7 78E-08	Benzo(k)fluoranthene	N/A	N/A	--	N/A	--
			Carbazole	4 40E-09	--	2 25E-09	6 66E-09	Carbazole	N/A	N/A	--	N/A	--
			Chrysene	9 21E-09	--	4 71E-09	1 39E-08	Chrysene	N/A	N/A	--	N/A	--
			Dibenz(a,h)anthracene	3 75E-06	--	1 92E-06	5 67E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	--
			Indeno(1,2,3-cd)pyrene	6 28E-07	--	3 22E-07	9 50E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	--
			(Total)	3 03E-05	--	9 45E-06	3 97E-05	(Total)		--	--	--	--
	Particulates	Particulate Dust Inhalation from Subsurface Soils	Antimony	--	--	--	--	Antimony	N/A	--		--	--
			Arsenic	--	2 56E-08	--	2 56E-08	Arsenic	N/A	--		--	--
			Chromium	--	1 07E-07	--	1 07E-07	Chromium	Lung	--		--	--
			Lead	--	--	--	--	Lead	N/A	--		--	--
			Manganese	--	--	--	--	Manganese	CNS	--		--	--
			Mercury	--	--	--	--	Mercury	CNS	--		--	--
			Vanadium	--	--	--	--	Vanadium	N/A	--		--	--
			Zinc	--	--	--	--	Zinc	N/A	--		--	--
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--		--	--
			Dieldrin	--	1 87E-11	--	1 87E-11	Dieldrin	N/A	--		--	--
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--		--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--		--	--
			Benzo(a)pyrene	--	6 29E-10	--	6 29E-10	Benzo(a)pyrene	N/A	--		--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--		--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--		--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--		--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--		--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--		--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--		--	--
			(Total)	--	1 34E-07	--	1 34E-07	(Total)		--	--	--	--
						Total Risk Across Subsurface Soils	3 98E-05				Total Hazard Index Across Subsurface Soils		--

TABLE 6-9.9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RESIDENT EXPOSURE TO SUBSURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Receptor Population	Resident
Receptor Age	Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soils	Subsurface Soils	Contact with Subsurface Soils											
			Antimony	--	--	--	--	Antimony	Blood	1 80E-01	--	NA	1 80E-01
			Arsenic	1 03E-05	--	9 70E-07	1 13E-05	Arsenic	Skin	2 67E-01	--	2 51E-02	2 92E-01
			Chromium	--	--	--	--	Chromium	Kidney	4 12E-02	--	NA	4 12E-02
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	5 25E-02	--	NA	5 25E-02
			Mercury	--	--	--	--	Mercury	CNS	2 69E-02	--	NA	2 69E-02
			Vanadium	--	--	--	--	Vanadium	NOAEL	2 22E-02	--	NA	2 22E-02
			Zinc	--	--	--	--	Zinc	Blood	1 61E-02	--	NA	1 61E-02
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--	--	--	--
			Dieldrin	7 57E-08	--	NA	7 57E-08	Dieldrin	Liver	1 10E-03	--	NA	1 10E-03
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	6 10E-07	--	2 49E-07	8 59E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	6 00E-06	--	2 45E-06	8 45E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	5 35E-07	--	2 19E-07	7 54E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	3 49E-08	--	1 43E-08	4 92E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	2 99E-09	--	1 22E-09	4 21E-09	Carbazole	N/A	--	--	--	--
			Chrysene	6 25E-09	--	2 55E-09	8 80E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 54E-06	--	1 04E-06	3 58E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4 26E-07	--	1 74E-07	6 00E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	2 05E-05	--	5 12E-06	2 56E-05	(Total)		6 07E-01	--	2 51E-02	6 32E-01
	Particulates	Particulate Dust Inhalation from Subsurface Soils											
			Antimony	--	--	--	--	Antimony	N/A	--	--	--	--
			Arsenic	--	1 13E-08	--	1 13E-08	Arsenic	N/A	--	--	--	--
			Chromium	--	4 74E-08	--	4 74E-08	Chromium	Lung	--	4 71E-04	--	4 71E-04
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	2 88E-02	--	2 88E-02
			Mercury	--	--	--	--	Mercury	CNS	--	3 42E-06	--	3 42E-06
			Vanadium	--	--	--	--	Vanadium	N/A	--	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	--	--	--	--
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--	--	--	--
			Dieldrin	--	8 26E-12	--	8 26E-12	Dieldrin	N/A	--	--	--	--
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	2 78E-10	--	2 78E-10	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	5 90E-08	--	5 90E-08	(Total)		--	2 93E-02	--	2 93E-02
						Total Risk Across Subsurface Soils	2 57E-05					Total Hazard Index Across Subsurface Soils	6 61E-01

TABLE 6-9.10
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RESIDENT EXPOSURE TO SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Receptor Population	Resident
Receptor Age	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soils	Subsurface Soils	Contact with Subsurface Soils											
			Antimony	--	--	--	--	Antimony	Blood	2 13E-02	--	NA	2 13E-02
			Arsenic	4 88E-06	--	8 21E-07	5 70E-06	Arsenic	Skin	3 16E-02	--	5 32E-03	3 69E-02
			Chromium	--	--	--	--	Chromium	Kidney	4 88E-03	--	NA	4 88E-03
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	6 22E-03	--	NA	6 22E-03
			Mercury	--	--	--	--	Mercury	CNS	3 19E-03	--	NA	3 19E-03
			Vanadium	--	--	--	--	Vanadium	NOAEL	2 63E-03	--	NA	2 63E-03
			Zinc	--	--	--	--	Zinc	Blood	1 91E-03	--	NA	1 91E-03
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--	--	--	--
			Dieldrin	3 59E-08	--	NA	3 59E-08	Dieldrin	Liver	1 31E-04	--	NA	1 31E-04
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	2 89E-07	--	2 11E-07	5 00E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	2 84E-06	--	2 08E-06	4 92E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 54E-07	--	1 85E-07	4 39E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 66E-08	--	1 21E-08	2 86E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	1 42E-09	--	1 03E-09	2 45E-09	Carbazole	N/A	--	--	--	--
			Chrysene	2 96E-09	--	2 16E-09	5 12E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1 21E-06	--	8 80E-07	2 09E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 02E-07	--	1 47E-07	3 50E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	9 73E-06	--	4 34E-06	1 41E-05	(Total)		7 19E-02	--	5 32E-03	7 72E-02
	Particulates	Particulate Dust Inhalation from Subsurface Soils											
			Antimony	--	--	--	--	Antimony	N/A	--	--	--	--
			Arsenic	--	1 43E-08	--	1 43E-08	Arsenic	N/A	--	--	--	--
			Chromium	--	5 99E-08	--	5 99E-08	Chromium	Lung	--	1 49E-04	--	1 49E-04
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	9 12E-03	--	9 12E-03
			Mercury	--	--	--	--	Mercury	CNS	--	1 08E-06	--	1 08E-06
			Vanadium	--	--	--	--	Vanadium	N/A	--	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	--	--	--	--
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--	--	--	--
			Dieldrin	--	1 04E-11	--	1 04E-11	Dieldrin	N/A	--	--	--	--
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	3 51E-10	--	3 51E-10	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	7 46E-08	--	7 46E-08	(Total)		--	9 27E-03	--	9 27E-03
						Total Risk Across Subsurface Soils	1 41E-05					Total Hazard Index Across Subsurface Soils	8 65E-02

TABLE 6-9.11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT EXCAVATION WORKER EXPOSURE TO SUBSURFACE SOILS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Receptor Population	Excavation Worker
Receptor Age	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Subsurface Soils	Subsurface Soils	Contact with Subsurface Soils	Antimony	--	--	--	--	Antimony	Blood	6 65E-02	--	NA	6 65E-02
			Arsenic	6 34E-07	--	2 22E-08	6 57E-07	Arsenic	Skin	9 87E-02	--	3 46E-03	1 02E-01
			Chromium	--	--	--	--	Chromium	Kidney	1 52E-02	--	NA	1 52E-02
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	1 94E-02	--	NA	1 94E-02
			Mercury	--	--	--	--	Mercury	CNS	9 96E-03	--	NA	9 96E-03
			Vanadium	--	--	--	--	Vanadium	NOAEL	8 21E-03	--	NA	8 21E-03
			Zinc	--	--	--	--	Zinc	Blood	5 95E-03	--	NA	5 95E-03
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--	--	--	--
			Dieldrin	4 67E-09	--	NA	4 67E-09	Dieldrin	Liver	4 09E-04	--	NA	4 09E-04
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	3 76E-08	--	5 71E-09	4 33E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	3 70E-07	--	5 62E-08	4 26E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	3 30E-08	--	5 02E-09	3 80E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	2 15E-09	--	3 27E-10	2 48E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	1 84E-10	--	2 80E-11	2 12E-10	Carbazole	N/A	--	--	--	--
			Chrysene	3 85E-10	--	5 85E-11	4 44E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1 57E-07	--	2 38E-08	1 81E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 63E-08	--	3 99E-09	3 03E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	1 27E-06	--	1 17E-07	1 38E-06	(Total)		2 24E-01	--	3 46E-03	2 28E-01
	Particulates	Particulate Dust Inhalation from Subsurface Soils	Antimony	--	--	--	--	Antimony	N/A	--	--	--	--
			Arsenic	--	2 66E-10	--	2 66E-10	Arsenic	N/A	--	--	--	--
			Chromium	--	1 12E-09	--	1 12E-09	Chromium	Lung	--	6 66E-05	--	6 66E-05
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	--	4 07E-03	--	4 07E-03
			Mercury	--	--	--	--	Mercury	CNS	--	4 83E-07	--	4 83E-07
			Vanadium	--	--	--	--	Vanadium	N/A	--	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	--	--	--	--
			Delta-BHC	--	--	--	--	Delta-BHC	N/A	--	--	--	--
			Dieldrin	--	1 95E-13	--	1 95E-13	Dieldrin	N/A	--	--	--	--
			4,6-Dinitro-2-methylphenol	--	--	--	--	4,6-Dinitro-2-methylphenol	N/A	--	--	--	--
			Benz(a)anthracene	--	--	--	--	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	--	6 54E-12	--	6 54E-12	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	--	--	--	--	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	--	--	--	--	Benzo(k)fluoranthene	N/A	--	--	--	--
			Carbazole	--	--	--	--	Carbazole	N/A	--	--	--	--
			Chrysene	--	--	--	--	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	--	--	--	--	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	--	--	--	--	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	--	1 39E-09	--	1 39E-09	(Total)		--	4 14E-03	--	4 14E-03
			Total Risk Across Subsurface Soils				1 38E-06	Total Hazard Index Across Subsurface Soils					2 32E-01

TABLE 6-9.12
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RESIDENT EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Contact with Sediment											
			Arsenic	4 90E-06	--	1 18E-06	6 09E-06	Arsenic	N/A	N/A	--	N/A	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	N/A	--
			Benz(a)anthracene	6 94E-07	--	7 26E-07	1 42E-06	Benz(a)anthracene	N/A	N/A	--	N/A	--
			Benzo(a)pyrene	5 12E-06	--	5 35E-06	1 05E-05	Benzo(a)pyrene	N/A	N/A	--	N/A	--
			Benzo(b)fluoranthene	6 21E-07	--	6 49E-07	1 27E-06	Benzo(b)fluoranthene	N/A	N/A	--	N/A	--
			Benzo(k)fluoranthene	2 63E-08	--	2 75E-08	5 38E-08	Benzo(k)fluoranthene	N/A	N/A	--	N/A	--
			Chrysene	6 21E-09	--	6 49E-09	1 27E-08	Chrysene	N/A	N/A	--	N/A	--
			Dibenz(a,h)anthracene	1 06E-06	--	1 11E-06	2 17E-06	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	--
			Indeno(1,2,3-cd)pyrene	3 65E-07	--	3 82E-07	7 47E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	--
			(Total)	1 28E-05	--	9 43E-06	2 22E-05	(Total)		--	--	--	--

Total Risk Across Sediment	2 22E-05
Total Risk Across All Media and All Exposure Routes	2 22E-05
Total Hazard Index Across Sediment	--
Total Hazard Index Across All Media and All Exposure Routes	--

TABLE 6-9.13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RESIDENT EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Contact with Sediment											
			Arsenic	3 33E-06	--	3 76E-07	3 70E-06	Arsenic	Skin	8 62E-02	--	9 76E-03	9 60E-02
			Manganese	--	--	--	--	Manganese	CNS	6 82E-02	--	NA	6 82E-02
			Benz(a)anthracene	4 71E-07	--	2 31E-07	7 02E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	3 47E-06	--	1 70E-06	5 17E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	4 21E-07	--	2 07E-07	6 28E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 78E-08	--	8 75E-09	2 66E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	4 21E-09	--	2 07E-09	6 28E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	7 19E-07	--	3 53E-07	1 07E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 48E-07	--	1 22E-07	3 69E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	8 68E-06	--	3 00E-06	1 17E-05	(Total)		1 54E-01	--	9 76E-03	1 64E-01
						Total Risk Across Sediment	1 17E-05					Total Hazard Index Across Sediment	1 64E-01
						Total Risk Across All Media and All Exposure Routes	1 17E-05					Total Hazard Index Across All Media and All Exposure Routes	1 64E-01

TABLE 6-9.14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RESIDENT EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Resident
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Contact with Sediment											
			Arsenic	1 58E-06	--	8 06E-07	2 38E-06	Arsenic	Skin	1 02E-02	--	5 22E-03	1 54E-02
			Manganese	--	--	--	--	Manganese	CNS	8 09E-03	--	NA	8 09E-03
			Benz(a)anthracene	2 23E-07	--	4 95E-07	7 18E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 65E-06	--	3 64E-06	5 29E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 00E-07	--	4 42E-07	6 42E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	8 46E-09	--	1 87E-08	2 72E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	2 00E-09	--	4 42E-09	6 42E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	3 41E-07	--	7 55E-07	1 10E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 18E-07	--	2 60E-07	3 78E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	4 12E-06	--	6 43E-06	1 05E-05	(Total)		1 83E-02	--	5 22E-03	2 35E-02
						Total Risk Across Sediment	1 05E-05					Total Hazard Index Across Sediment	2 35E-02
						Total Risk Across All Media and All Exposure Routes	1 05E-05					Total Hazard Index Across All Media and All Exposure Routes	2 35E-02

TABLE 6-9.15
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - YOUTH (AGE 1-12) SHORELINE VISITOR EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Current/Future
Receptor Population	Shoreline Visitor
Receptor Age	Youth (Age 1-12)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Contact with Sediment											
			Arsenic	2 70E-07	--	5 23E-08	3 23E-07	Arsenic	N/A	N/A	--	N/A	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	N/A	--
			Benz(a)anthracene	3 83E-08	--	3 21E-08	7 03E-08	Benz(a)anthracene	N/A	N/A	--	N/A	--
			Benzo(a)pyrene	2 82E-07	--	2 36E-07	5 18E-07	Benzo(a)pyrene	N/A	N/A	--	N/A	--
			Benzo(b)fluoranthene	3 42E-08	--	2 87E-08	6 29E-08	Benzo(b)fluoranthene	N/A	N/A	--	N/A	--
			Benzo(k)fluoranthene	1 45E-09	--	1 22E-09	2 67E-09	Benzo(k)fluoranthene	N/A	N/A	--	N/A	--
			Chrysene	3 42E-10	--	2 87E-10	6 29E-10	Chrysene	N/A	N/A	--	N/A	--
			Dibenz(a,h)anthracene	5 84E-08	--	4 90E-08	1 07E-07	Dibenz(a,h)anthracene	N/A	N/A	--	N/A	--
			Indeno(1,2,3-cd)pyrene	2 01E-08	--	1 69E-08	3 70E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	N/A	--
			(Total)	7 05E-07	--	4 17E-07	1 12E-06	(Total)		--	--	--	--
						Total Risk Across Sediment	1 12E-06					Total Hazard Index Across Sediment	--
						Total Risk Across All Media and All Exposure Routes	1 12E-06					Total Hazard Index Across All Media and All Exposure Routes	---

TABLE 6-9.16
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD (AGE 1-4) SHORELINE VISITOR EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Current/Future
Receptor Population	Shoreline Visitor
Receptor Age	Child (Age 1-4)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Contact with Sediment											
			Arsenic	1 29E-07	--	1 34E-08	1 42E-07	Arsenic	Skin	5 00E-03	--	5 22E-04	5 53E-03
			Manganese	--	--	--	--	Manganese	CNS	3 96E-03	--	NA	3 96E-03
			Benz(a)anthracene	1 82E-08	--	8 23E-09	2 65E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 34E-07	--	6 07E-08	1 95E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 63E-08	--	7 36E-09	2 37E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	6 91E-10	--	3 12E-10	1 00E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	1 63E-10	--	7 36E-11	2 37E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 78E-08	--	1 26E-08	4 04E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	9 59E-09	--	4 33E-09	1 39E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	3 36E-07	--	1 07E-07	4 43E-07	(Total)		8 96E-03	--	5 22E-04	9 49E-03
						Total Risk Across Sediment	4 43E-07					Total Hazard Index Across Sediment	9 49E-03
						Total Risk Across All Media and All Exposure Routes	4 43E-07					Total Hazard Index Across All Media and All Exposure Routes	9 49E-03

TABLE 6-9.17
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - YOUTH (AGE 5-12) SHORELINE VISITOR EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Current/Future
Receptor Population Shoreline Visitor
Receptor Age Youth (Age 5-12)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	Contact with Sediment											
			Arsenic	1 42E-07	--	3 89E-08	1 80E-07	Arsenic	Skin	2 75E-03	--	7 56E-04	3 51E-03
			Manganese	--	--	--	--	Manganese	CNS	2 18E-03	--	NA	2 18E-03
			Benz(a)anthracene	2 00E-08	--	2 38E-08	4 39E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 48E-07	--	1 76E-07	3 23E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 79E-08	--	2 13E-08	3 93E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(k)fluoranthene	7 60E-10	--	9 04E-10	1 66E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	1 79E-10	--	2 13E-10	3 93E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	3 06E-08	--	3 64E-08	6 70E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 05E-08	--	1 26E-08	2 31E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	3 69E-07	--	3 10E-07	6 79E-07	(Total)		4 93E-03	--	7 56E-04	5 69E-03
						Total Risk Across Sediment	6 79E-07					Total Hazard Index Across Sediment	5 69E-03
						Total Risk Across All Media and All Exposure Routes	6 79E-07					Total Hazard Index Across All Media and All Exposure Routes	5 69E-03

TABLE 6-9.18
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	1 20E-03	--	--	1 20E-03	Arsenic	Skin	7 81E+00	--	--	7 81E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	3 48E+00	--	--	3 48E+00
			Chromium	--	--	--	--	Chromium	Kidney	1 56E+00	--	--	1 56E+00
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	9 67E+00	--	--	9 67E+00
			Nickel	--	--	--	--	Nickel	Decr Org Wt	5 34E-01	--	--	5 34E-01
			Silver	--	--	--	--	Silver		1 92E-01	--	--	1 92E-01
			Zinc	--	--	--	--	Zinc	Blood	2 49E-01	--	--	2 49E-01
			2,4'-DDD	9 40E-09	--	--	9 40E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	2 00E-08	--	--	2 00E-08	2,4'-DDT	Liver	3 43E-04	--	--	3 43E-04
			4,4'-DDD	2 34E-08	--	--	2 34E-08	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	4 15E-07	--	--	4 15E-07	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	1 33E-08	--	--	1 33E-08	4,4'-DDT	Liver	2 29E-04	--	--	2 29E-04
			Dieldrin	6 72E-06	--	--	6 72E-06	Dieldrin	Liver	2 45E-02	--	--	2 45E-02
			Total PCB Congeners	4 98E-05	--	--	4 98E-05	Total PCB Congeners	Skin/Eye	3 63E+00	--	--	3 63E+00
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	6 49E-06	--	--	6 49E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 18E-04	--	--	1 18E-04	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 28E-05	--	--	1 28E-05	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	6 11E-07	--	--	6 11E-07	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	8 09E-08	--	--	8 09E-08	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 56E-06	--	--	2 56E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6 93E-06	--	--	6 93E-06	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	1 41E-03	--	--	1 41E-03	(Total)		2 72E+01	--	--	2 72E+01
						Total Risk Across Lobster	1 41E-03					Total Hazard Index Across Lobster	2 72E+01

TABLE 6-9.19
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RECREATIONAL PERSON EXPOSURE TO LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	9 74E-05	--	--	9 74E-05	Arsenic	N/A	N/A	--	--	--
			Cadmium	--	--	--	--	Cadmium	N/A	N/A	--	--	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	--	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	--	--
			Mercury	--	--	--	--	Mercury	N/A	N/A	--	--	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	--	--
			Silver	--	--	--	--	Silver	N/A	N/A	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	N/A	--	--	--
			2,4'-DDD	7 60E-10	--	--	7 60E-10	2,4'-DDD	N/A	N/A	--	--	--
			2,4'-DDT	1 62E-09	--	--	1 62E-09	2,4'-DDT	N/A	N/A	--	--	--
			4,4'-DDD	1 90E-09	--	--	1 90E-09	4,4'-DDD	N/A	N/A	--	--	--
			4,4'-DDE	3 36E-08	--	--	3 36E-08	4,4'-DDE	N/A	N/A	--	--	--
			4,4'-DDT	1 08E-09	--	--	1 08E-09	4,4'-DDT	N/A	N/A	--	--	--
			Dieldrin	5 43E-07	--	--	5 43E-07	Dieldrin	N/A	N/A	--	--	--
			Total PCB Congeners	4 03E-06	--	--	4 03E-06	Total PCB Congeners	N/A	N/A	--	--	--
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	N/A	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	N/A	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	N/A	--	--	--
			Benz(a)anthracene	5 25E-07	--	--	5 25E-07	Benz(a)anthracene	N/A	N/A	--	--	--
			Benzo(a)pyrene	9 54E-06	--	--	9 54E-06	Benzo(a)pyrene	N/A	N/A	--	--	--
			Benzo(b)fluoranthene	1 04E-06	--	--	1 04E-06	Benzo(b)fluoranthene	N/A	N/A	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	N/A	--	--	--
			Benzo(k)fluoranthene	4 94E-08	--	--	4 94E-08	Benzo(k)fluoranthene	N/A	N/A	--	--	--
			Chrysene	6 54E-09	--	--	6 54E-09	Chrysene	N/A	N/A	--	--	--
			Dibenz(a,h)anthracene	2 07E-07	--	--	2 07E-07	Dibenz(a,h)anthracene	N/A	N/A	--	--	--
			Indeno(1,2,3-cd)pyrene	5 60E-07	--	--	5 60E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	N/A	--	--	--
			(Total)	1 14E-04	--	--	1 14E-04	(Total)		--	--	--	--
						Total Risk Across Lobster	1 14E-04					Total Hazard Index Across Lobster	--

TABLE 6-9.20
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL PERSON EXPOSURE TO LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	2 51E-05	--	--	2 51E-05	Arsenic	Skin	6 52E-01	--	--	6 52E-01
			Cadmium	--	--	--	--	Cadmium	Kidney	2 91E-01	--	--	2 91E-01
			Chromium	--	--	--	--	Chromium	Kidney	1 30E-01	--	--	1 30E-01
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	8 07E-01	--	--	8 07E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	4 46E-02	--	--	4 46E-02
			Silver	--	--	--	--	Silver		1 60E-02	--	--	1 60E-02
			Zinc	--	--	--	--	Zinc	Blood	2 08E-02	--	--	2 08E-02
			2,4'-DDD	1 96E-10	--	--	1 96E-10	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	4 17E-10	--	--	4 17E-10	2,4'-DDT	Liver	2 86E-05	--	--	2 86E-05
			4,4'-DDD	4 89E-10	--	--	4 89E-10	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	8 67E-09	--	--	8 67E-09	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	2 79E-10	--	--	2 79E-10	4,4'-DDT	Liver	1 91E-05	--	--	1 91E-05
			Dieldrin	1 40E-07	--	--	1 40E-07	Dieldrin	Liver	2 05E-03	--	--	2 05E-03
			Total PCB Congeners	1 04E-06	--	--	1 04E-06	Total PCB Congeners	Skin/Eye	3 03E-01	--	--	3 03E-01
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	1 35E-07	--	--	1 35E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	2 46E-06	--	--	2 46E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 68E-07	--	--	2 68E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 28E-08	--	--	1 28E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	1 69E-09	--	--	1 69E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	5 35E-08	--	--	5 35E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 45E-07	--	--	1 45E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	2 94E-05	--	--	2 94E-05	(Total)		2 27E+00	--	--	2 27E+00
						Total Risk Across Lobster	2 94E-05					Total Hazard Index Across Lobster	2 27E+00

TABLE 6-9.21
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL PERSON EXPOSURE TO LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Receptor Population	Recreational Person
Receptor Age	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	7 23E-05	--	--	7 23E-05	Arsenic	Skin	4 68E-01	--	--	4 68E-01
			Cadmium	--	--	--	--	Cadmium	Kidney	2 09E-01	--	--	2 09E-01
			Chromium	--	--	--	--	Chromium	Kidney	9 37E-02	--	--	9 37E-02
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	5 80E-01	--	--	5 80E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	3 21E-02	--	--	3 21E-02
			Silver	--	--	--	--	Silver		1 15E-02	--	--	1 15E-02
			Zinc	--	--	--	--	Zinc	Blood	1 50E-02	--	--	1 50E-02
			2,4'-DDD	5 64E-10	--	--	5 64E-10	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	1 20E-09	--	--	1 20E-09	2,4'-DDT	Liver	2 06E-05	--	--	2 06E-05
			4,4'-DDD	1 41E-09	--	--	1 41E-09	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	2 49E-08	--	--	2 49E-08	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	8 01E-10	--	--	8 01E-10	4,4'-DDT	Liver	1 37E-05	--	--	1 37E-05
			Dieldrin	4 03E-07	--	--	4 03E-07	Dieldrin	Liver	1 47E-03	--	--	1 47E-03
			Total PCB Congeners	2 99E-06	--	--	2 99E-06	Total PCB Congeners	Skin/Eye	2 18E-01	--	--	2 18E-01
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	3 89E-07	--	--	3 89E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	7 08E-06	--	--	7 08E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	7 69E-07	--	--	7 69E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	3 67E-08	--	--	3 67E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	4 85E-09	--	--	4 85E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1 54E-07	--	--	1 54E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4 16E-07	--	--	4 16E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	8 45E-05	--	--	8 45E-05	(Total)		1 63E+00	--	--	1 63E+00
						Total Risk Across Lobster	8 45E-05					Total Hazard Index Across Lobster	1 63E+00

TABLE 6-9.22
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	4 52E-04	--	--	4 52E-04	Arsenic	Skin	7 81E+00	--	--	7 81E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	3 48E+00	--	--	3 48E+00
			Chromium	--	--	--	--	Chromium	Kidney	1 56E+00	--	--	1 56E+00
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	9 67E+00	--	--	9 67E+00
			Nickel	--	--	--	--	Nickel	Decr Org Wt	5 34E-01	--	--	5 34E-01
			Silver	--	--	--	--	Silver		1 92E-01	--	--	1 92E-01
			Zinc	--	--	--	--	Zinc	Blood	2 49E-01	--	--	2 49E-01
			2,4'-DDD	3 53E-09	--	--	3 53E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	7 50E-09	--	--	7 50E-09	2,4'-DDT	Liver	3 43E-04	--	--	3 43E-04
			4,4'-DDD	8 79E-09	--	--	8 79E-09	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	1 56E-07	--	--	1 56E-07	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	5 01E-09	--	--	5 01E-09	4,4'-DDT	Liver	2 29E-04	--	--	2 29E-04
			Dieldrin	2 52E-06	--	--	2 52E-06	Dieldrin	Liver	2 45E-02	--	--	2 45E-02
			Total PCB Congeners	1 87E-05	--	--	1 87E-05	Total PCB Congeners	Skin/Eye	3 63E+00	--	--	3 63E+00
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	2 43E-06	--	--	2 43E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	4 42E-05	--	--	4 42E-05	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	4 81E-06	--	--	4 81E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	2 29E-07	--	--	2 29E-07	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	3 03E-08	--	--	3 03E-08	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	9 62E-07	--	--	9 62E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 60E-06	--	--	2 60E-06	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	5 28E-04	--	--	5 28E-04	(Total)		2 72E+01	--	--	2 72E+01
						Total Risk Across Lobster	5 28E-04					Total Hazard Index Across Lobster	2 72E+01

TABLE 6-9.23
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RECREATIONAL PERSON EXPOSURE TO LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster	Arsenic	3 55E-05	--	--	3 55E-05	Arsenic	N/A	N/A	--	--	--
			Cadmium	--	--	--	--	Cadmium	N/A	N/A	--	--	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	--	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	--	--
			Mercury	--	--	--	--	Mercury	N/A	N/A	--	--	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	--	--
			Silver	--	--	--	--	Silver	N/A	N/A	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	N/A	--	--	--
			2,4'-DDD	2 77E-10	--	--	2 77E-10	2,4'-DDD	N/A	N/A	--	--	--
			2,4'-DDT	5 89E-10	--	--	5 89E-10	2,4'-DDT	N/A	N/A	--	--	--
			4,4'-DDD	6 91E-10	--	--	6 91E-10	4,4'-DDD	N/A	N/A	--	--	--
			4,4'-DDE	1 22E-08	--	--	1 22E-08	4,4'-DDE	N/A	N/A	--	--	--
			4,4'-DDT	3 93E-10	--	--	3 93E-10	4,4'-DDT	N/A	N/A	--	--	--
			Dieldrin	1 98E-07	--	--	1 98E-07	Dieldrin	N/A	N/A	--	--	--
			Total PCB Congeners	1 47E-06	--	--	1 47E-06	Total PCB Congeners	N/A	N/A	--	--	--
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	N/A	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	N/A	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	N/A	--	--	--
			Benz(a)anthracene	1 91E-07	--	--	1 91E-07	Benz(a)anthracene	N/A	N/A	--	--	--
			Benzo(a)pyrene	3 47E-06	--	--	3 47E-06	Benzo(a)pyrene	N/A	N/A	--	--	--
			Benzo(b)fluoranthene	3 78E-07	--	--	3 78E-07	Benzo(b)fluoranthene	N/A	N/A	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	N/A	--	--	--
			Benzo(k)fluoranthene	1 80E-08	--	--	1 80E-08	Benzo(k)fluoranthene	N/A	N/A	--	--	--
			Chrysene	2 38E-09	--	--	2 38E-09	Chrysene	N/A	N/A	--	--	--
			Dibenz(a,h)anthracene	7 55E-08	--	--	7 55E-08	Dibenz(a,h)anthracene	N/A	N/A	--	--	--
			Indeno(1,2,3-cd)pyrene	2 04E-07	--	--	2 04E-07	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	N/A	--	--	--
			(Total)	4 15E-05	--	--	4 15E-05	(Total)		--	--	--	--
						Total Risk Across Lobster	4 15E-05					Total Hazard Index Across Lobster	--

TABLE 6-9.24
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	1 63E-03	--	--	1 63E-03	Arsenic	Skin	1 06E+01	--	--	1 06E+01
			Boron	--	--	--	--	Boron	Reproductive	9 68E-02	--	--	9 68E-02
			Cadmium	--	--	--	--	Cadmium	Kidney	2 10E+00	--	--	2 10E+00
			Chromium	--	--	--	--	Chromium	Kidney	6 79E+00	--	--	6 79E+00
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	1 82E-01	--	--	1 82E-01
			Mercury	--	--	--	--	Mercury	CNS	7 81E+00	--	--	7 81E+00
			Nickel	--	--	--	--	Nickel	Decr Org Wt	3 08E-01	--	--	3 08E-01
			Selenium	--	--	--	--	Selenium	Blood/Skin/CNS	8 11E-02	--	--	8 11E-02
			Silver	--	--	--	--	Silver		2 39E-02	--	--	2 39E-02
			Vanadium	--	--	--	--	Vanadium	NOAEL	1 46E-01	--	--	1 46E-01
			Zinc	--	--	--	--	Zinc	Blood	8 31E-02	--	--	8 31E-02
			2,4'-DDD	3 31E-07	--	--	3 31E-07	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	7 15E-08	--	--	7 15E-08	2,4'-DDT	Liver	1 23E-03	--	--	1 23E-03
			4,4'-DDD	5 39E-08	--	--	5 39E-08	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	1 34E-07	--	--	1 34E-07	4,4'-DDE	N/A	--	--	--	--
			Dieldrin	5 37E-06	--	--	5 37E-06	Dieldrin	Liver	1 96E-02	--	--	1 96E-02
			Total PCB Congeners	7 01E-05	--	--	7 01E-05	Total PCB Congeners	Skin/Eye	5 11E+00	--	--	5 11E+00
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	1 01E-06	--	--	1 01E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	6 47E-06	--	--	6 47E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 04E-06	--	--	1 04E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	7 13E-08	--	--	7 13E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	1 32E-08	--	--	1 32E-08	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	9 94E-07	--	--	9 94E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6 62E-07	--	--	6 62E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	1 72E-03	--	--	1 72E-03	(Total)		3 33E+01	--	--	3 33E+01
						Total Risk Across Clams	1 72E-03					Total Hazard Index Across Clams	3 33E+01

TABLE 6-9.25
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RECREATIONAL PERSON EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	1 32E-04	--	--	1 32E-04	Arsenic	N/A	N/A	--	--	--
			Boron	--	--	--	--	Boron	N/A	N/A	--	--	--
			Cadmium	--	--	--	--	Cadmium	N/A	N/A	--	--	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	--	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	--	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	--	--
			Mercury	--	--	--	--	Mercury	N/A	N/A	--	--	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	--	--
			Selenium	--	--	--	--	Selenium	N/A	N/A	--	--	--
			Silver	--	--	--	--	Silver	N/A	N/A	--	--	--
			Vanadium	--	--	--	--	Vanadium	N/A	N/A	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	N/A	--	--	--
			2,4'-DDD	2 68E-08	--	--	2 68E-08	2,4'-DDD	N/A	N/A	--	--	--
			2,4'-DDT	5 79E-09	--	--	5 79E-09	2,4'-DDT	N/A	N/A	--	--	--
			4,4'-DDD	4 36E-09	--	--	4 36E-09	4,4'-DDD	N/A	N/A	--	--	--
			4,4'-DDE	1 08E-08	--	--	1 08E-08	4,4'-DDE	N/A	N/A	--	--	--
			Dieldrin	4 34E-07	--	--	4 34E-07	Dieldrin	N/A	N/A	--	--	--
			Total PCB Congeners	5 67E-06	--	--	5 67E-06	Total PCB Congeners	N/A	N/A	--	--	--
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	N/A	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	N/A	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	N/A	--	--	--
			Benz(a)anthracene	8 21E-08	--	--	8 21E-08	Benz(a)anthracene	N/A	N/A	--	--	--
			Benzo(a)pyrene	5 24E-07	--	--	5 24E-07	Benzo(a)pyrene	N/A	N/A	--	--	--
			Benzo(b)fluoranthene	8 37E-08	--	--	8 37E-08	Benzo(b)fluoranthene	N/A	N/A	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	N/A	--	--	--
			Benzo(k)fluoranthene	5 77E-09	--	--	5 77E-09	Benzo(k)fluoranthene	N/A	N/A	--	--	--
			Chrysene	1 06E-09	--	--	1 06E-09	Chrysene	N/A	N/A	--	--	--
			Dibenz(a,h)anthracene	8 04E-08	--	--	8 04E-08	Dibenz(a,h)anthracene	N/A	N/A	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	N/A	--	--	--
			Indeno(1,2,3-cd)pyrene	5 35E-08	--	--	5 35E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	N/A	--	--	--
			(Total)	1 39E-04	--	--	1 39E-04	(Total)		--	--	--	--
						Total Risk Across Clams	1 39E-04					Total Hazard Index Across Clams	--

TABLE 6-9.26
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL PERSON EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Receptor Population	Recreational Person
Receptor Age	Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	3 41E-05	--	--	3 41E-05	Arsenic	Skin	8 85E-01	--	--	8 85E-01
			Boron	--	--	--	--	Boron	Reproductive	8 08E-03	--	--	8 08E-03
			Cadmium	--	--	--	--	Cadmium	Kidney	1 75E-01	--	--	1 75E-01
			Chromium	--	--	--	--	Chromium	Kidney	5 67E-01	--	--	5 67E-01
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	1 52E-02	--	--	1 52E-02
			Mercury	--	--	--	--	Mercury	CNS	6 52E-01	--	--	6 52E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	2 57E-02	--	--	2 57E-02
			Selenium	--	--	--	--	Selenium	Blood/Skin/CNS	6 77E-03	--	--	6 77E-03
			Silver	--	--	--	--	Silver		1 99E-03	--	--	1 99E-03
			Vanadium	--	--	--	--	Vanadium	NOAEL	1 22E-02	--	--	1 22E-02
			Zinc	--	--	--	--	Zinc	Blood	6 94E-03	--	--	6 94E-03
			2,4'-DDD	6 92E-09	--	--	6 92E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	1 49E-09	--	--	1 49E-09	2,4'-DDT	Liver	1 02E-04	--	--	1 02E-04
			4,4'-DDD	1 12E-09	--	--	1 12E-09	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	2 79E-09	--	--	2 79E-09	4,4'-DDE	N/A	--	--	--	--
			Dieldrin	1 12E-07	--	--	1 12E-07	Dieldrin	Liver	1 63E-03	--	--	1 63E-03
			Total PCB Congeners	1 46E-06	--	--	1 46E-06	Total PCB Congeners	Skin/Eye	4 27E-01	--	--	4 27E-01
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	2 12E-08	--	--	2 12E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 35E-07	--	--	1 35E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 16E-08	--	--	2 16E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 49E-09	--	--	1 49E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	2 75E-10	--	--	2 75E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 08E-08	--	--	2 08E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 38E-08	--	--	1 38E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	3 59E-05	--	--	3 59E-05	(Total)		2 78E+00	--	--	2 78E+00
						Total Risk Across Clams	3 59E-05					Total Hazard Index Across Clams	2 78E+00

TABLE 6-9.27
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL PERSON EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	9 81E-05	--	--	9 81E-05	Arsenic	Skin	6 36E-01	--	--	6 36E-01
			Boron	--	--	--	--	Boron	Reproductive	5 81E-03	--	--	5 81E-03
			Cadmium	--	--	--	--	Cadmium	Kidney	1 26E-01	--	--	1 26E-01
			Chromium	--	--	--	--	Chromium	Kidney	4 08E-01	--	--	4 08E-01
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	1 09E-02	--	--	1 09E-02
			Mercury	--	--	--	--	Mercury	CNS	4 68E-01	--	--	4 68E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	1 85E-02	--	--	1 85E-02
			Selenium	--	--	--	--	Selenium	Blood/Skin/CNS	4 87E-03	--	--	4 87E-03
			Silver	--	--	--	--	Silver		1 43E-03	--	--	1 43E-03
			Vanadium	--	--	--	--	Vanadium	NOAEL	8 76E-03	--	--	8 76E-03
			Zinc	--	--	--	--	Zinc	Blood	4 99E-03	--	--	4 99E-03
			2,4'-DDD	1 99E-08	--	--	1 99E-08	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	4 29E-09	--	--	4 29E-09	2,4'-DDT	Liver	7 36E-05	--	--	7 36E-05
			4,4'-DDD	3 23E-09	--	--	3 23E-09	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	8 03E-09	--	--	8 03E-09	4,4'-DDE	N/A	--	--	--	--
			Dieldrin	3 22E-07	--	--	3 22E-07	Dieldrin	Liver	1 17E-03	--	--	1 17E-03
			Total PCB Congeners	4 20E-06	--	--	4 20E-06	Total PCB Congeners	Skin/Eye	3 07E-01	--	--	3 07E-01
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	6 09E-08	--	--	6 09E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	3 88E-07	--	--	3 88E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	6 21E-08	--	--	6 21E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	4 28E-09	--	--	4 28E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	7 90E-10	--	--	7 90E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	5 97E-08	--	--	5 97E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3 97E-08	--	--	3 97E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	1 03E-04	--	--	1 03E-04	(Total)		2 00E+00	--	--	2 00E+00
						Total Risk Across Clams	1 03E-04					Total Hazard Index Across Clams	2 00E+00

TABLE 6-9.28
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	6 13E-04	--	--	6 13E-04	Arsenic	Skin	1 06E+01	--	--	1 06E+01
			Boron	--	--	--	--	Boron	Reproductive	8 19E-02	--	--	8 19E-02
			Cadmium	--	--	--	--	Cadmium	Kidney	2 10E+00	--	--	2 10E+00
			Chromium	--	--	--	--	Chromium	Kidney	1 33E+00	--	--	1 33E+00
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	8 00E-02	--	--	8 00E-02
			Mercury	--	--	--	--	Mercury	CNS	7 81E+00	--	--	7 81E+00
			Nickel	--	--	--	--	Nickel	Decr Org Wt	3 08E-01	--	--	3 08E-01
			Selenium	--	--	--	--	Selenium	Blood/Skin/CNS	4 62E-02	--	--	4 62E-02
			Silver	--	--	--	--	Silver		2 39E-02	--	--	2 39E-02
			Vanadium	--	--	--	--	Vanadium	NOAEL	9 86E-02	--	--	9 86E-02
			Zinc	--	--	--	--	Zinc	Blood	8 31E-02	--	--	8 31E-02
			2,4'-DDD	1 24E-07	--	--	1 24E-07	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	2 68E-08	--	--	2 68E-08	2,4'-DDT	Liver	1 23E-03	--	--	1 23E-03
			4,4'-DDD	2 02E-08	--	--	2 02E-08	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	5 02E-08	--	--	5 02E-08	4,4'-DDE	N/A	--	--	--	--
			Dieldrin	2 01E-06	--	--	2 01E-06	Dieldrin	Liver	1 96E-02	--	--	1 96E-02
			Total PCB Congeners	2 63E-05	--	--	2 63E-05	Total PCB Congeners	Skin/Eye	5 11E+00	--	--	5 11E+00
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	3 81E-07	--	--	3 81E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	2 43E-06	--	--	2 43E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	3 88E-07	--	--	3 88E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	2 67E-08	--	--	2 67E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	4 94E-09	--	--	4 94E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	3 73E-07	--	--	3 73E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 48E-07	--	--	2 48E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	6 45E-04	--	--	6 45E-04	(Total)		2 77E+01	--	--	2 77E+01
						Total Risk Across Clams	6 45E-04					Total Hazard Index Across Clams	2 77E+01

TABLE 6-9.29
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RECREATIONAL PERSON EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	4 81E-05	--	--	4 81E-05	Arsenic	N/A	N/A	--	--	--
			Boron	--	--	--	--	Boron	N/A	N/A	--	--	--
			Cadmium	--	--	--	--	Cadmium	N/A	N/A	--	--	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	--	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	--	--
			Manganese	--	--	--	--	Manganese	N/A	N/A	--	--	--
			Mercury	--	--	--	--	Mercury	N/A	N/A	--	--	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	--	--
			Selenium	--	--	--	--	Selenium	N/A	N/A	--	--	--
			Silver	--	--	--	--	Silver	N/A	N/A	--	--	--
			Vanadium	--	--	--	--	Vanadium	N/A	N/A	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	N/A	--	--	--
			2,4'-DDD	9 76E-09	--	--	9 76E-09	2,4'-DDD	N/A	N/A	--	--	--
			2,4'-DDT	2 11E-09	--	--	2 11E-09	2,4'-DDT	N/A	N/A	--	--	--
			4,4'-DDD	1 59E-09	--	--	1 59E-09	4,4'-DDD	N/A	N/A	--	--	--
			4,4'-DDE	3 94E-09	--	--	3 94E-09	4,4'-DDE	N/A	N/A	--	--	--
			Dieldrin	1 58E-07	--	--	1 58E-07	Dieldrin	N/A	N/A	--	--	--
			Total PCB Congeners	2 06E-06	--	--	2 06E-06	Total PCB Congeners	N/A	N/A	--	--	--
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	N/A	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	N/A	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	N/A	--	--	--
			Benz(a)anthracene	2 99E-08	--	--	2 99E-08	Benz(a)anthracene	N/A	N/A	--	--	--
			Benzo(a)pyrene	1 91E-07	--	--	1 91E-07	Benzo(a)pyrene	N/A	N/A	--	--	--
			Benzo(b)fluoranthene	3 05E-08	--	--	3 05E-08	Benzo(b)fluoranthene	N/A	N/A	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	N/A	--	--	--
			Benzo(k)fluoranthene	2 10E-09	--	--	2 10E-09	Benzo(k)fluoranthene	N/A	N/A	--	--	--
			Chrysene	3 88E-10	--	--	3 88E-10	Chrysene	N/A	N/A	--	--	--
			Dibenz(a,h)anthracene	2 93E-08	--	--	2 93E-08	Dibenz(a,h)anthracene	N/A	N/A	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	N/A	--	--	--
			Indeno(1,2,3-cd)pyrene	1 95E-08	--	--	1 95E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	N/A	--	--	--
			(Total)	5 07E-05	--	--	5 07E-05	(Total)		--	--	--	--
						Total Risk Across Clams	5 07E-05					Total Hazard Index Across Clams	--

TABLE 6-9.30
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL PERSON EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	1 14E-05	--	--	1 14E-05	Arsenic	Skin	8 85E-01	--	--	8 85E-01
			Boron	--	--	--	--	Boron	Reproductive	6 84E-03	--	--	6 84E-03
			Cadmium	--	--	--	--	Cadmium	Kidney	1 75E-01	--	--	1 75E-01
			Chromium	--	--	--	--	Chromium	Kidney	1 11E-01	--	--	1 11E-01
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	6 68E-03	--	--	6 68E-03
			Mercury	--	--	--	--	Mercury	CNS	6 52E-01	--	--	6 52E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	2 57E-02	--	--	2 57E-02
			Selenium	--	--	--	--	Selenium	Blood/Skin/CNS	3 86E-03	--	--	3 86E-03
			Silver	--	--	--	--	Silver		1 99E-03	--	--	1 99E-03
			Vanadium	--	--	--	--	Vanadium	NOAEL	8 24E-03	--	--	8 24E-03
			Zinc	--	--	--	--	Zinc	Blood	6 94E-03	--	--	6 94E-03
			2,4'-DDD	2 31E-09	--	--	2 31E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	4 98E-10	--	--	4 98E-10	2,4'-DDT	Liver	1 02E-04	--	--	1 02E-04
			4,4'-DDD	3 75E-10	--	--	3 75E-10	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	9 31E-10	--	--	9 31E-10	4,4'-DDE	N/A	--	--	--	--
			Dieldrin	3 73E-08	--	--	3 73E-08	Dieldrin	Liver	1 63E-03	--	--	1 63E-03
			Total PCB Congeners	4 88E-07	--	--	4 88E-07	Total PCB Congeners	Skin/Eye	4 27E-01	--	--	4 27E-01
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	7 06E-09	--	--	7 06E-09	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	4 50E-08	--	--	4 50E-08	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	7 20E-09	--	--	7 20E-09	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	4 96E-10	--	--	4 96E-10	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	9 16E-11	--	--	9 16E-11	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	6 92E-09	--	--	6 92E-09	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4 60E-09	--	--	4 60E-09	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	1 20E-05	--	--	1 20E-05	(Total)		2 31E+00	--	--	2 31E+00
						Total Risk Across Clams	1 20E-05					Total Hazard Index Across Clams	2 31E+00

TABLE 6-9.31
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL PERSON EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe	Future
Receptor Population	Recreational Person
Receptor Age	Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	3 68E-05	--	--	3 68E-05	Arsenic	Skin	6 36E-01	--	--	6 36E-01
			Boron	--	--	--	--	Boron	Reproductive	4 91E-03	--	--	4 91E-03
			Cadmium	--	--	--	--	Cadmium	Kidney	1 26E-01	--	--	1 26E-01
			Chromium	--	--	--	--	Chromium	Kidney	8 00E-02	--	--	8 00E-02
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Manganese	--	--	--	--	Manganese	CNS	4 80E-03	--	--	4 80E-03
			Mercury	--	--	--	--	Mercury	CNS	4 68E-01	--	--	4 68E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	1 85E-02	--	--	1 85E-02
			Selenium	--	--	--	--	Selenium	Blood/Skin/CNS	2 77E-03	--	--	2 77E-03
			Silver	--	--	--	--	Silver		1 43E-03	--	--	1 43E-03
			Vanadium	--	--	--	--	Vanadium	NOAEL	5 92E-03	--	--	5 92E-03
			Zinc	--	--	--	--	Zinc	Blood	4 99E-03	--	--	4 99E-03
			2,4'-DDD	7 46E-09	--	--	7 46E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	1 61E-09	--	--	1 61E-09	2,4'-DDT	Liver	7 36E-05	--	--	7 36E-05
			4,4'-DDD	1 21E-09	--	--	1 21E-09	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	3 01E-09	--	--	3 01E-09	4,4'-DDE	N/A	--	--	--	--
			Dieldrin	1 21E-07	--	--	1 21E-07	Dieldrin	Liver	1 17E-03	--	--	1 17E-03
			Total PCB Congeners	1 58E-06	--	--	1 58E-06	Total PCB Congeners	Skin/Eye	3 07E-01	--	--	3 07E-01
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	2 28E-08	--	--	2 28E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 46E-07	--	--	1 46E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 33E-08	--	--	2 33E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 60E-09	--	--	1 60E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	2 96E-10	--	--	2 96E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 24E-08	--	--	2 24E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Dibenzothiophene	--	--	--	--	Dibenzothiophene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 49E-08	--	--	1 49E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	3 87E-05	--	--	3 87E-05	(Total)		1 66E+00	--	--	1 66E+00
						Total Risk Across Clams	3 87E-05					Total Hazard Index Across Clams	1 66E+00

TABLE 6-9.32
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels											
			Arsenic	3 23E-04	--	--	3 23E-04	Arsenic	Skin	2 09E+00	--	--	2 09E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	4 19E+00	--	--	4 19E+00
			Chromium	--	--	--	--	Chromium	Kidney	3 70E+00	--	--	3 70E+00
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	7 45E+00	--	--	7 45E+00
			Nickel	--	--	--	--	Nickel	Decr Org Wt	1 47E-01	--	--	1 47E-01
			Zinc	--	--	--	--	Zinc	Blood	1 37E-01	--	--	1 37E-01
			2,4'-DDD	7 91E-08	--	--	7 91E-08	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	8 59E-08	--	--	8 59E-08	2,4'-DDT	Liver	1 47E-03	--	--	1 47E-03
			4,4'-DDD	2 04E-07	--	--	2 04E-07	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	5 78E-07	--	--	5 78E-07	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	1 50E-07	--	--	1 50E-07	4,4'-DDT	Liver	2 58E-03	--	--	2 58E-03
			Alpha-Chlordane	1 62E-07	--	--	1 62E-07	Alpha-Chlordane	Liver	2 70E-03	--	--	2 70E-03
			Dieldrin	8 67E-06	--	--	8 67E-06	Dieldrin	Liver	3 16E-02	--	--	3 16E-02
			Heptachlor Epoxide	4 09E-07	--	--	4 09E-07	Heptachlor Epoxide	Liver	1 01E-02	--	--	1 01E-02
			Total PCB Congeners	9 24E-05	--	--	9 24E-05	Total PCB Congeners	Skin/Eye	6 74E+00	--	--	6 74E+00
			trans-Nonachlor	1 34E-07	--	--	1 34E-07	trans-Nonachlor	Liver	2 24E-03	--	--	2 24E-03
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	1 09E-06	--	--	1 09E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	6 55E-06	--	--	6 55E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 29E-06	--	--	1 29E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	1 35E-07	--	--	1 35E-07	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	2 52E-08	--	--	2 52E-08	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1 06E-06	--	--	1 06E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6 66E-07	--	--	6 66E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	4 36E-04	--	--	4 36E-04	(Total)		2 45E+01	--	--	2 45E+01
						Total Risk Across Blue Mussels	4 36E-04					Total Hazard Index Across Blue Mussels	2 45E+01

TABLE 6-9.33
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - LIFETIME RECREATIONAL PERSON EXPOSURE TO BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels											
			Arsenic	2 61E-05	--	--	2 61E-05	Arsenic	N/A	N/A	--	--	--
			Cadmium	--	--	--	--	Cadmium	N/A	N/A	--	--	--
			Chromium	--	--	--	--	Chromium	N/A	N/A	--	--	--
			Lead	--	--	--	--	Lead	N/A	N/A	--	--	--
			Mercury	--	--	--	--	Mercury	N/A	N/A	--	--	--
			Nickel	--	--	--	--	Nickel	N/A	N/A	--	--	--
			Zinc	--	--	--	--	Zinc	N/A	N/A	--	--	--
			2,4'-DDD	6 40E-09	--	--	6 40E-09	2,4'-DDD	N/A	N/A	--	--	--
			2,4'-DDT	6 95E-09	--	--	6 95E-09	2,4'-DDT	N/A	N/A	--	--	--
			4,4'-DDD	1 65E-08	--	--	1 65E-08	4,4'-DDD	N/A	N/A	--	--	--
			4,4'-DDE	4 68E-08	--	--	4 68E-08	4,4'-DDE	N/A	N/A	--	--	--
			4,4'-DDT	1 21E-08	--	--	1 21E-08	4,4'-DDT	N/A	N/A	--	--	--
			Alpha-Chlordane	1 31E-08	--	--	1 31E-08	Alpha-Chlordane	N/A	N/A	--	--	--
			Dieldrin	7 01E-07	--	--	7 01E-07	Dieldrin	N/A	N/A	--	--	--
			Heptachlor Epoxide	3 30E-08	--	--	3 30E-08	Heptachlor Epoxide	N/A	N/A	--	--	--
			Total PCB Congeners	7 48E-06	--	--	7 48E-06	Total PCB Congeners	N/A	N/A	--	--	--
			trans-Nonachlor	1 09E-08	--	--	1 09E-08	trans-Nonachlor	N/A	N/A	--	--	--
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	N/A	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	N/A	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	N/A	--	--	--
			Benz(a)anthracene	8 82E-08	--	--	8 82E-08	Benz(a)anthracene	N/A	N/A	--	--	--
			Benzo(a)pyrene	5 30E-07	--	--	5 30E-07	Benzo(a)pyrene	N/A	N/A	--	--	--
			Benzo(b)fluoranthene	1 04E-07	--	--	1 04E-07	Benzo(b)fluoranthene	N/A	N/A	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	N/A	--	--	--
			Benzo(k)fluoranthene	1 09E-08	--	--	1 09E-08	Benzo(k)fluoranthene	N/A	N/A	--	--	--
			Chrysene	2 04E-09	--	--	2 04E-09	Chrysene	N/A	N/A	--	--	--
			Dibenz(a,h)anthracene	8 54E-08	--	--	8 54E-08	Dibenz(a,h)anthracene	N/A	N/A	--	--	--
			Indeno(1,2,3-cd)pyrene	5 38E-08	--	--	5 38E-08	Indeno(1,2,3-cd)pyrene	N/A	N/A	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	N/A	--	--	--
			(Total)	3 53E-05	--	--	3 53E-05	(Total)		--	--	--	--
						Total Risk Across Blue Mussels	3 53E-05					Total Hazard Index Across Blue Mussels	--

TABLE 6-9.34
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CHILD RECREATIONAL PERSON EXPOSURE TO BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels											
			Arsenic	6 74E-06	--	--	6 74E-06	Arsenic	Skin	1 75E-01	--	--	1 75E-01
			Cadmium	--	--	--	--	Cadmium	Kidney	3 50E-01	--	--	3 50E-01
			Chromium	--	--	--	--	Chromium	Kidney	3 09E-01	--	--	3 09E-01
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	6 22E-01	--	--	6 22E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	1 22E-02	--	--	1 22E-02
			Zinc	--	--	--	--	Zinc	Blood	1 14E-02	--	--	1 14E-02
			2,4'-DDD	1 65E-09	--	--	1 65E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	1 79E-09	--	--	1 79E-09	2,4'-DDT	Liver	1 23E-04	--	--	1 23E-04
			4,4'-DDD	4 26E-09	--	--	4 26E-09	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	1 21E-08	--	--	1 21E-08	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	3 13E-09	--	--	3 13E-09	4,4'-DDT	Liver	2 15E-04	--	--	2 15E-04
			Alpha-Chlordane	3 38E-09	--	--	3 38E-09	Alpha-Chlordane	Liver	2 26E-04	--	--	2 26E-04
			Dieldrin	1 81E-07	--	--	1 81E-07	Dieldrin	Liver	2 64E-03	--	--	2 64E-03
			Heptachlor Epoxide	8 53E-09	--	--	8 53E-09	Heptachlor Epoxide	Liver	8 41E-04	--	--	8 41E-04
			Total PCB Congeners	1 93E-06	--	--	1 93E-06	Total PCB Congeners	Skin/Eye	5 63E-01	--	--	5 63E-01
			trans-Nonachlor	2 81E-09	--	--	2 81E-09	trans-Nonachlor	Liver	1 87E-04	--	--	1 87E-04
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	2 28E-08	--	--	2 28E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1 37E-07	--	--	1 37E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	2 69E-08	--	--	2 69E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	2 82E-09	--	--	2 82E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	5 27E-10	--	--	5 27E-10	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 20E-08	--	--	2 20E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1 39E-08	--	--	1 39E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	9 11E-06	--	--	9 11E-06	(Total)		2 05E+00	--	--	2 05E+00
						Total Risk Across Blue Mussels	9 11E-06					Total Hazard Index Across Blue Mussels	2 05E+00

TABLE 6-9.35
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL PERSON EXPOSURE TO BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels											
			Arsenic	1 94E-05	--	--	1 94E-05	Arsenic	Skin	1 25E-01	--	--	1 25E-01
			Cadmium	--	--	--	--	Cadmium	Kidney	2 52E-01	--	--	2 52E-01
			Chromium	--	--	--	--	Chromium	Kidney	2 22E-01	--	--	2 22E-01
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	4 47E-01	--	--	4 47E-01
			Nickel	--	--	--	--	Nickel	Decr Org Wt	8 79E-03	--	--	8 79E-03
			Zinc	--	--	--	--	Zinc	Blood	8 22E-03	--	--	8 22E-03
			2,4'-DDD	4 75E-09	--	--	4 75E-09	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	5 15E-09	--	--	5 15E-09	2,4'-DDT	Liver	8 84E-05	--	--	8 84E-05
			4,4'-DDD	1 22E-08	--	--	1 22E-08	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	3 47E-08	--	--	3 47E-08	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	9 01E-09	--	--	9 01E-09	4,4'-DDT	Liver	1 55E-04	--	--	1 55E-04
			Alpha-Chlordane	9 72E-09	--	--	9 72E-09	Alpha-Chlordane	Liver	1 62E-04	--	--	1 62E-04
			Dieldrin	5 20E-07	--	--	5 20E-07	Dieldrin	Liver	1 90E-03	--	--	1 90E-03
			Heptachlor Epoxide	2 45E-08	--	--	2 45E-08	Heptachlor Epoxide	Liver	6 04E-04	--	--	6 04E-04
			Total PCB Congeners	5 55E-06	--	--	5 55E-06	Total PCB Congeners	Skin/Eye	4 04E-01	--	--	4 04E-01
			trans-Nonachlor	8 07E-09	--	--	8 07E-09	trans-Nonachlor	Liver	1 34E-04	--	--	1 34E-04
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	6 54E-08	--	--	6 54E-08	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	3 93E-07	--	--	3 93E-07	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	7 73E-08	--	--	7 73E-08	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	8 11E-09	--	--	8 11E-09	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	1 51E-09	--	--	1 51E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	6 34E-08	--	--	6 34E-08	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3 99E-08	--	--	3 99E-08	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	2 62E-05	--	--	2 62E-05	(Total)		1 47E+00	--	--	1 47E+00
						Total Risk Across Blue Mussels	2 62E-05					Total Hazard Index Across Blue Mussels	1 47E+00

TABLE 6-9.36
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO BLUE MUSSELS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels											
			Arsenic	1 21E-04	--	--	1 21E-04	Arsenic	Skin	2 09E+00	--	--	2 09E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	4 19E+00	--	--	4 19E+00
			Chromium	--	--	--	--	Chromium	Kidney	1 13E+00	--	--	1 13E+00
			Lead	--	--	--	--	Lead	N/A	--	--	--	--
			Mercury	--	--	--	--	Mercury	CNS	7 45E+00	--	--	7 45E+00
			Nickel	--	--	--	--	Nickel	Decr Org Wt	1 47E-01	--	--	1 47E-01
			Zinc	--	--	--	--	Zinc	Blood	1 37E-01	--	--	1 37E-01
			2,4'-DDD	2 97E-08	--	--	2 97E-08	2,4'-DDD	N/A	--	--	--	--
			2,4'-DDT	3 22E-08	--	--	3 22E-08	2,4'-DDT	Liver	1 47E-03	--	--	1 47E-03
			4,4'-DDD	7 65E-08	--	--	7 65E-08	4,4'-DDD	N/A	--	--	--	--
			4,4'-DDE	2 17E-07	--	--	2 17E-07	4,4'-DDE	N/A	--	--	--	--
			4,4'-DDT	5 63E-08	--	--	5 63E-08	4,4'-DDT	Liver	2 58E-03	--	--	2 58E-03
			Alpha-Chlordane	4 86E-08	--	--	4 86E-08	Alpha-Chlordane	Liver	2 16E-03	--	--	2 16E-03
			Dieldrin	3 25E-06	--	--	3 25E-06	Dieldrin	Liver	3 16E-02	--	--	3 16E-02
			Heptachlor Epoxide	7 15E-08	--	--	7 15E-08	Heptachlor Epoxide	Liver	4 70E-03	--	--	4 70E-03
			Total PCB Congeners	3 47E-05	--	--	3 47E-05	Total PCB Congeners	Skin/Eye	6 74E+00	--	--	6 74E+00
			trans-Nonachlor	5 04E-08	--	--	5 04E-08	trans-Nonachlor	Liver	2 24E-03	--	--	2 24E-03
			1-Methylphenanthrene	--	--	--	--	1-Methylphenanthrene	N/A	--	--	--	--
			2,3,5-Trimethylnaphthalene	--	--	--	--	2,3,5-Trimethylnaphthalene	N/A	--	--	--	--
			2,6-Dimethylnaphthalene	--	--	--	--	2,6-Dimethylnaphthalene	N/A	--	--	--	--
			Benz(a)anthracene	4 09E-07	--	--	4 09E-07	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	2 46E-06	--	--	2 46E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	4 83E-07	--	--	4 83E-07	Benzo(b)fluoranthene	N/A	--	--	--	--
			Benzo(e)pyrene	--	--	--	--	Benzo(e)pyrene	N/A	--	--	--	--
			Benzo(k)fluoranthene	5 07E-08	--	--	5 07E-08	Benzo(k)fluoranthene	N/A	--	--	--	--
			Chrysene	9 46E-09	--	--	9 46E-09	Chrysene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	3 96E-07	--	--	3 96E-07	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2 50E-07	--	--	2 50E-07	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			Perylene	--	--	--	--	Perylene	N/A	--	--	--	--
			(Total)	1 64E-04	--	--	1 64E-04	(Total)		2 19E+01	--	--	2 19E+01
						Total Risk Across Blue Mussels	1 64E-04					Total Hazard Index Across Blue Mussels	2 19E+01

TABLE 6-10.1
RISK ASSESSMENT SUMMARY - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	1.20E-03	--	--	1.20E-03	Arsenic	Skin	7 81E+00	--	--	7.81E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	3 48E+00	--	--	3 48E+00
			Chromium	--	--	--	--	Chromium	Kidney	1 56E+00	--	--	1.56E+00
			Mercury	--	--	--	--	Mercury	CNS	9 67E+00	--	--	9.67E+00
			Dieldrin	6 72E-06	--	--	6 72E-06	Dieldrin	Liver	2.45E-02	--	--	2.45E-02
			Total PCB Congeners	4.98E-05	--	--	4.98E-05	Total PCB Congeners	Skin/Eye	3 63E+00	--	--	3 63E+00
			Benz(a)anthracene	6.49E-06	--	--	6 49E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	1.18E-04	--	--	1 18E-04	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1.28E-05	--	--	1.28E-05	Benzo(b)fluoranthene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	2 56E-06	--	--	2 56E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	6 93E-06	--	--	6 93E-06	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	1.41E-03	--	--	1.41E-03	(Total)		2.62E+01	--	--	2.62E+01
						Total Risk Across Lobster	1 41E-03					Total Hazard Index Across Lobster	2.62E+01

TABLE 6-10.2
RISK ASSESSMENT SUMMARY - LIFETIME RECREATIONAL PERSON EXPOSURE TO LOBSTER
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	9 74E-05	--	--	9 74E-05	Arsenic	N/A	N/A	--	--	--
			Total PCB Congeners	4 03E-06	--	--	4 03E-06	Total PCB Congeners	N/A	N/A	--	--	--
			Benzo(a)pyrene	9.54E-06	--	--	9 54E-06	Benzo(a)pyrene	N/A	N/A	--	--	--
			Benzo(b)fluoranthene	1.04E-06	--	--	1.04E-06	Benzo(b)fluoranthene	N/A	N/A	--	--	--
			(Total)	1 12E-04	--	--	1.12E-04	(Total)		--	--	--	--
						Total Risk Across Lobster	1 12E-04					Total Hazard Index Across Lobster	--

TABLE 6-10.3
RISK ASSESSMENT SUMMARY - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	4 52E-04	--	--	4.52E-04	Arsenic	Skin	7.81E+00	--	--	7 81E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	3.48E+00	--	--	3 48E+00
			Chromium	--	--	--	--	Chromium	Kidney	1 56E+00	--	--	1.56E+00
			Mercury	--	--	--	--	Mercury	CNS	9 67E+00	--	--	9 67E+00
			Dieldrin	2 52E-06	--	--	2.52E-06	Dieldrin	Liver	2.45E-02	--	--	2 45E-02
			Total PCB Congeners	1.87E-05	--	--	1.87E-05	Total PCB Congeners	Skin/Eye	3.63E+00	--	--	3 63E+00
			Benz(a)anthracene	2.43E-06	--	--	2 43E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	4 42E-05	--	--	4 42E-05	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	4 81E-06	--	--	4 81E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.60E-06	--	--	2.60E-06	Indeno(1,2,3-cd)pyrene	N/A	--	--	--	--
			(Total)	5.27E-04	--	--	5 27E-04	(Total)		2.62E+01	--	--	2 62E+01
						Total Risk Across Lobster	5.27E-04					Total Hazard Index Across Lobster	2 62E+01

TABLE 6-10.4
RISK ASSESSMENT SUMMARY - LIFETIME RECREATIONAL PERSON EXPOSURE TO LOBSTER
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe. Future
Receptor Population. Recreational Person
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Lobster	Animal Tissue	Ingestion of Lobster											
			Arsenic	3.55E-05	--	--	3 55E-05	Arsenic	N/A	N/A	--	--	--
			Total PCB Congeners	1 47E-06	--	--	1 47E-06	Total PCB Congeners	N/A	N/A	--	--	--
			Benzo(a)pyrene	3 47E-06	--	--	3.47E-06	Benzo(a)pyrene	N/A	N/A	--	--	--
			(Total)	4.04E-05	--	--	4 04E-05	(Total)		--	--	--	--
						Total Risk Across Lobster	4 04E-05					Total Hazard Index Across Lobster	--

TABLE 6-10.5
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	1 63E-03	--	--	1.63E-03	Arsenic	Skin	1.06E+01	--	--	1.06E+01
								Cadmium	Kidney	2.10E+00	--	--	2.10E+00
								Chromium	Kidney	6.79E+00	--	--	6 79E+00
								Mercury	CNS	7.81E+00	--	--	7.81E+00
			Dieldrin	5 37E-06	--	--	5.37E-06						
			Total PCB Congeners	7.01E-05	--	--	7.01E-05	Total PCB Congeners	Skin/Eye	5 11E+00	--	--	5 11E+00
			Benz(a)anthracene	1.01E-06	--	--	1.01E-06						
			Benzo(a)pyrene	6 47E-06	--	--	6.47E-06						
			Benzo(b)fluoranthene	1.04E-06	--	--	1 04E-06						
			(Total)	1.71E-03	--	--	1 71E-03	(Total)		3.24E+01	--	--	3.24E+01
						Total Risk Across Clams	1.71E-03					Total Hazard Index Across Clams	3.24E+01

TABLE 6-10.6
RISK ASSESSMENT SUMMARY - LIFETIME RECREATIONAL PERSON EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population Recreational Person
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	1 32E-04	--	--	1 32E-04	Arsenic	N/A	N/A	--	--	--
			Total PCB Congeners	5 67E-06	--	--	5 67E-06	Total PCB Congeners	N/A	N/A	--	--	--
			(Total)	1 38E-04	--	--	1 38E-04	(Total)		--	--	--	--
						Total Risk Across Clams	1 38E-04					Total Hazard Index Across Clams	--

TABLE 6-10.7
RISK ASSESSMENT SUMMARY - CHILD RECREATIONAL PERSON EXPOSURE TO CLAMS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	3 41E-05	--	--	3 41E-05	Arsenic	Skin	8.85E-01	--	--	8 85E-01
			Total PCB Congeners	1.46E-06	--	--	1 46E-06	Total PCB Congeners	Skin/Eye	4 27E-01	--	--	4.27E-01
			(Total)	3.56E-05	--	--	3 56E-05	(Total)		1.31E+00	--	--	1 31E+00
						Total Risk Across Clams	3 56E-05					Total Hazard Index Across Clams	1 31E+00

TABLE 6-10.8
RISK ASSESSMENT SUMMARY - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	6 13E-04	--	--	6.13E-04	Arsenic	Skin	1 06E+01	--	--	1 06E+01
								Cadmium	Kidney	2 10E+00	--	--	2 10E+00
								Chromium	Kidney	1 33E+00	--	--	1.33E+00
								Mercury	CNS	7.81E+00	--	--	7.81E+00
			Dieldrin	2 01E-06	--	--	2 01E-06						
			Total PCB Congeners	2 63E-05	--	--	2 63E-05	Total PCB Congeners	Skin/Eye	5 11E+00	--	--	5 11E+00
			Benzo(a)pyrene	2.43E-06	--	--	2 43E-06	Benzo(a)pyrene	N/A	--	--	--	--
			(Total)	6.44E-04	--	--	6 44E-04	(Total)		2 69E+01	--	--	2 69E+01
						Total Risk Across Clams	6.44E-04					Total Hazard Index Across Clams	2 69E+01

TABLE 6-10.9
RISK ASSESSMENT SUMMARY - LIFETIME RECREATIONAL PERSON EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population: Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	4 81E-05	--	--	4.81E-05	Arsenic	N/A	N/A	--	--	--
			Total PCB Congeners	2.06E-06	--	--	2.06E-06	Total PCB Congeners	N/A	N/A	--	--	--
			(Total)	5.02E-05	--	--	5 02E-05	(Total)		--	--	--	--
						Total Risk Across Clams	5.02E-05					Total Hazard Index Across Clams	--

TABLE 6-10.10
RISK ASSESSMENT SUMMARY - CHILD RECREATIONAL PERSON EXPOSURE TO CLAMS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe: Future
Receptor Population Recreational Person
Receptor Age. Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Clams	Animal Tissue	Ingestion of Clams											
			Arsenic	1.14E-05	--	--	1 14E-05	Arsenic	Skin	8.85E-01	--	--	8 85E-01
			Total PCB Congeners	4.88E-07	--	--	4 88E-07	Total PCB Congeners	Skin/Eye	4 27E-01	--	--	4 27E-01
			(Total)	1.19E-05	--	--	1.19E-05	(Total)		1.31E+00	--	--	1 31E+00
						Total Risk Across Clams	1.19E-05					Total Hazard Index Across Clams	1.31E+00

TABLE 6-10.11
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population: Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels											
			Arsenic	3.23E-04	--	--	3 23E-04	Arsenic	Skin	2.09E+00	--	--	2 09E+00
			Cadmium	--	--	--	--	Cadmium	Kidney	4 19E+00	--	--	4 19E+00
			Chromium	--	--	--	--	Chromium	Kidney	3 70E+00	--	--	3.70E+00
			Mercury	--	--	--	--	Mercury	CNS	7 45E+00	--	--	7.45E+00
			Dieldrin	8 67E-06	--	--	8 67E-06						
			Total PCB Congeners	9 24E-05	--	--	9 24E-05	Total PCB Congeners	Skin/Eye	6.74E+00	--	--	6.74E+00
			Benz(a)anthracene	1.09E-06	--	--	1 09E-06	Benz(a)anthracene	N/A	--	--	--	--
			Benzo(a)pyrene	6 55E-06	--	--	6 55E-06	Benzo(a)pyrene	N/A	--	--	--	--
			Benzo(b)fluoranthene	1 29E-06	--	--	1 29E-06	Benzo(b)fluoranthene	N/A	--	--	--	--
			Dibenz(a,h)anthracene	1.06E-06	--	--	1 06E-06	Dibenz(a,h)anthracene	N/A	--	--	--	--
			(Total)	4.34E-04	--	--	4 34E-04	(Total)		2 42E+01	--	--	2.42E+01
						Total Risk Across Blue Mussels	4.34E-04					Total Hazard Index Across Blue Mussels	2.42E+01

TABLE 6-10.12
RISK ASSESSMENT SUMMARY - LIFETIME RECREATIONAL PERSON EXPOSURE TO BLUE MUSSELS
REASONABLE MAXIMUM EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Recreational Person
Receptor Age Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels	Arsenic	2 61E-05	--	--	2 61E-05	Arsenic	N/A	N/A	--	--	--
			Total PCB Congeners	7 48E-06	--	--	7.48E-06	Total PCB Congeners	N/A	N/A	--	--	--
			(Total)	3.36E-05	--	--	3.36E-05	(Total)		--	--	--	--
						Total Risk Across Blue Mussels	3 36E-05					Total Hazard Index Across Blue Mussels	--

TABLE 6-10.13
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT SUBSISTENCE FISHERMAN EXPOSURE TO BLUE MUSSELS
CENTRAL TENDENCY EXPOSURE
FINAL REMEDIAL INVESTIGATION
NAVSTA NEWPORT, NEWPORT, RHODE ISLAND

Scenario Timeframe Future
Receptor Population Subsistence Fisherman
Receptor Age Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Blue Mussels	Animal Tissue	Ingestion of Blue Mussels	Arsenic	1 21E-04	--	--	1.21E-04	Arsenic	Skin	2.09E+00	--	--	2.09E+00
								Cadmium	Kidney	4 19E+00	--	--	4 19E+00
								Chromium	Kidney	1.13E+00	--	--	1 13E+00
								Mercury	CNS	7 45E+00	--	--	7.45E+00
			Dieldrin	3 25E-06	--	--	3 25E-06						
			Total PCB Congeners	3.47E-05	--	--	3 47E-05	Total PCB Congeners	Skin/Eye	6 74E+00	--	--	6 74E+00
			Benzo(a)pyrene	2 46E-06	--	--	2 46E-06						
			(Total)	1 61E-04	--	--	1.61E-04	(Total)		2.16E+01	--	--	2 16E+01
						Total Risk Across Blue Mussels	1 61E-04					Total Hazard Index Across Blue Mussels	2.16E+01

TABLE 7-1
SUMMARY OF EXPOSURE AND EFFECTS-BASED WEIGHTS OF EVIDENCE AND CHARACTERIZATION OF RISK FOR THE OFFTA ERA INVESTIGATION
FINAL REMEDIAL INVESTIGATION
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

WEIGHT OF EVIDENCE SUMMARY									
	CHEMICAL EXPOSURE INDICATORS				BIOLOGICAL EFFECTS INDICATORS				RISK PROBABILITY
Station	Bedded Sediment[1]	Resuspended Sediment[2]	Bioconcentration[3]	Exposure Ranking[7]	Sediment Toxicity[4]	Field Effects[5]	Tissue Residue Effects[6]	Effects Ranking[7]	Overall Ranking[8]
OFF-01	+	+	++	L	+	+	-	L	Low
OFF-02	+++	++	++	H	-	+	-	B	Intermediate
OFF-03	+++	+	+	I	-	+	-	B	Low
OFF-04	++	+++	++	H	-	+	-	B	Intermediate
OFF-05	+++	++	++	H	+++	++	-	H	High
OFF-06	+++	+	++	H	-	+	-	B	Intermediate
OFF-07	++	+	++	I	-	+		B	Low
OFF-08	++	+	+	L	-	+	-	B	Low
OFF-09	++	++	NA	I	++	-	-	L	Intermediate
OFF-10	++	+	++	I	-	+	-	B	Low
OFF-11	++	+	++	I	-	+	-	B	Low
OFF-12	++	++	+	I	-	+	-	B	Low
OFF-13	++	++	+	I	+	+	+	L	Intermediate
OFF-14	+	++	+	L	-	+	-	B	Low
OFF-15	++	+	++	I	-	+	+	L	Intermediate
OFF-16	++	+	+	L	-	+	-	B	Low
OFF-17	++	++	+	I	-	+	+	L	Intermediate
OFF-18	++	++	+	I	++	+	-	L	Intermediate
OFF-19	+	+	+	L	-	+	+	L	Low
OFF-20	+	++	+	L	++	+	-	L	Low
OFF-21	++	+	++	I	+	+	-	L	Intermediate
OFF-22	++	++	NA	I	-	+	-	B	Low
OFF-23	+	++	NA	I	++	+	-	L	Intermediate

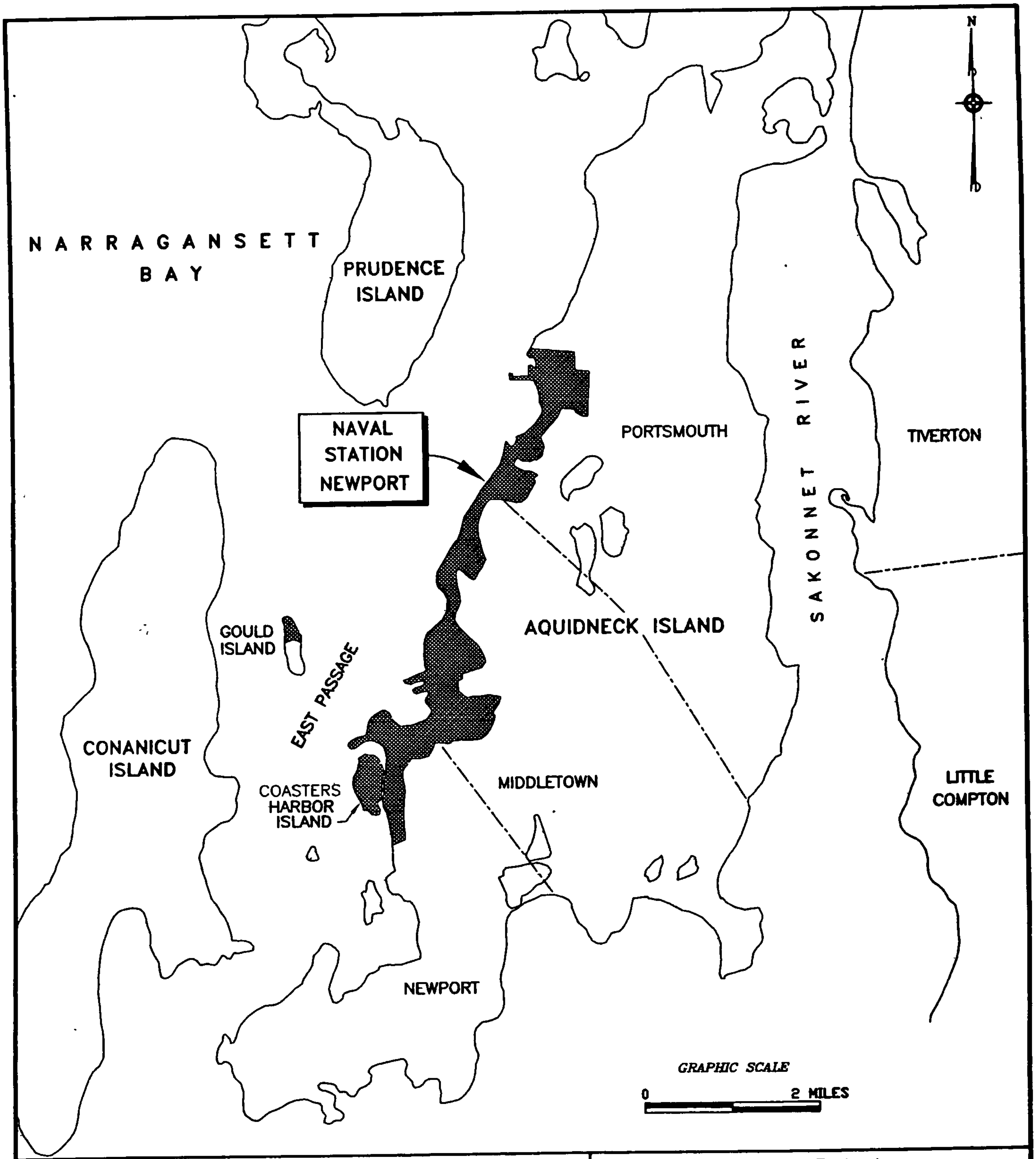
- = Baseline
+ = Low
++ = Intermediate
+++ = High

TABLE 7-1 (Cont'd)
SUMMARY OF EXPOSURE AND EFFECTS-BASED WEIGHTS OF EVIDENCE
AND CHARACTERIZATION OF RISK FOR THE OFFTA ERA INVESTIGATION
FINAL REMEDIAL INVESTIGATION
NAVAL STATION NEWPORT
NEWPORT, RHODE ISLAND

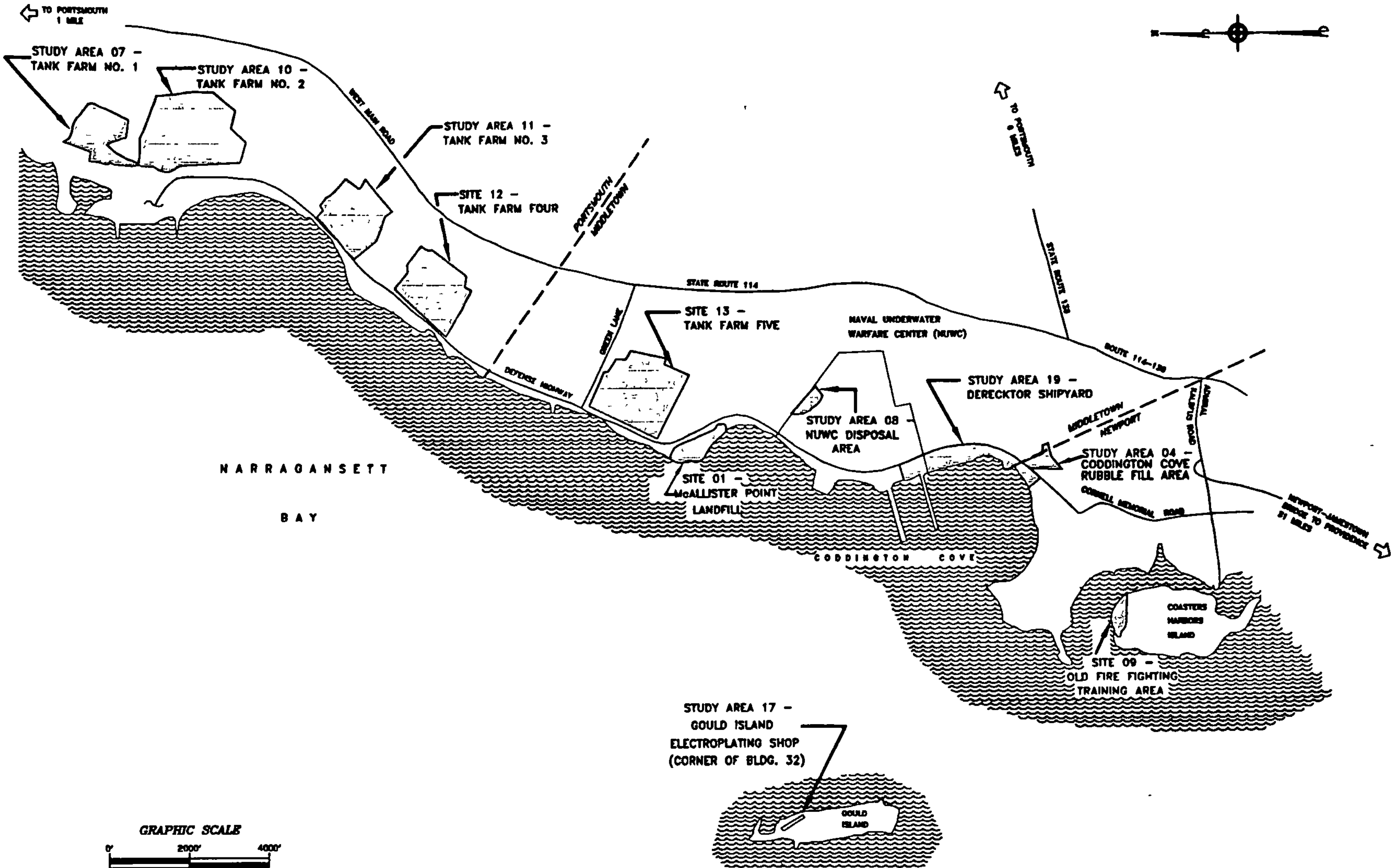
1. Bedded Sediment Exposure Ranking based on sediment and porewater Hazard Quotients, see Table 6.6-1 of the OFFTA Marine Ecological Risk Assessment Report (SAIC/URI, April 2000).
2 Resuspended Sediment Ranking based on Elutriate Hazard Quotients: see Table 6.6-1 of the OFFTA Marine Ecological Risk Assessment Report (SAIC/URI, April 2000)
3. Bioconcentration Ranking based on Tissue Concentration Ratios for mussels, clams, lobster and cunner; see Table 6 6-1 of the OFFTA Marine Ecological Risk Assessment Report (SAIC/URI, April 2000)
4. Sediment Toxicity Risk Ranking based on sediment and porewater toxicity tests see Table 6 6-2 of the OFFTA Marine Ecological Risk Assessment Report (SAIC/URI, April 2000).
5. Field Effects Ranking Based on results of Condition Index, Benthic Community Structure, Hematopoietic neoplasia, cytochrome P450, and avian predator exposures; see Table 6 6-2 of the OFFTA Marine Ecological Risk Assessment Report (SAIC/URI, April 2000)
6 Tissue-based Risk Ranking Based on risks of CoCs in tissues to aquatic receptors, see Table 6.6-2 of the OFFTA Marine Ecological Risk Assessment Report (SAIC/URI, April 2000)
7 Overall Exposure/Effects (E/E) Ranking based on indicators ("-" = Baseline; "+" = Low, "++" = Intermediate; "+++" = High)
   Baseline (B) = Low (+) E/E ranking observed for only one indicator; or baseline E/E ranking observed for all indicators;
   Low (L) = Intermediate (++) E/E ranking observed for only one indicator with no greater than low (+) E/E ranking observed for other indicators, or high (+++) E/E ranking observed for only one indicator with no greater than baseline (-) E/E ranking observed for other indicators, or low (+) E/E ranking observed for all indicators.
   Intermediate (I) = High (+++) E/E ranking observed for only one indicator with no greater than low (+) E/E ranking observed for other indicators, or Intermediate (++) E/E ranking observed for two or more indicators
   High (H) = High (+++) E/E ranking observed for one indicator with intermediate (++) or greater E/E ranking observed for other indicators
   E/E Rankings for stations for which two or fewer WoE observations were available are equal to the highest WoE ranking
   NA = Ranking not available
8. Overall Risk Ranking based on E/E WoE summaries
   Baseline = No greater than Baseline (B) ranking for both E/E WoE summaries;
   Low = No greater than Low (L) ranking for both E/E WoE summaries, or intermediate (I) ranking for one WoE summary and no greater than Baseline (B) ranking for the other summary;
   Intermediate = Intermediate (I) ranking for both E/E WoE summaries; or High (H) ranking for one WoE summary and no greater than Low (L) ranking for the other WoE summary,
   High = High (+++) E/E ranking observed for one WoE summary with greater than Intermediate (++) E/E ranking observed for the other WoE summary.

Source: Old Fire Fighting Training Area (OFFTA) Marine Ecological Risk Assessment (ERA) Report, Naval Station Newport, Newport, Rhode Island, Prepared by Science Applications International Corporation (SAIC) and the University of Rhode Island (URI), under contract to Tetra Tech NUS, Inc , for Department of the Navy, Northern Division, April 2000

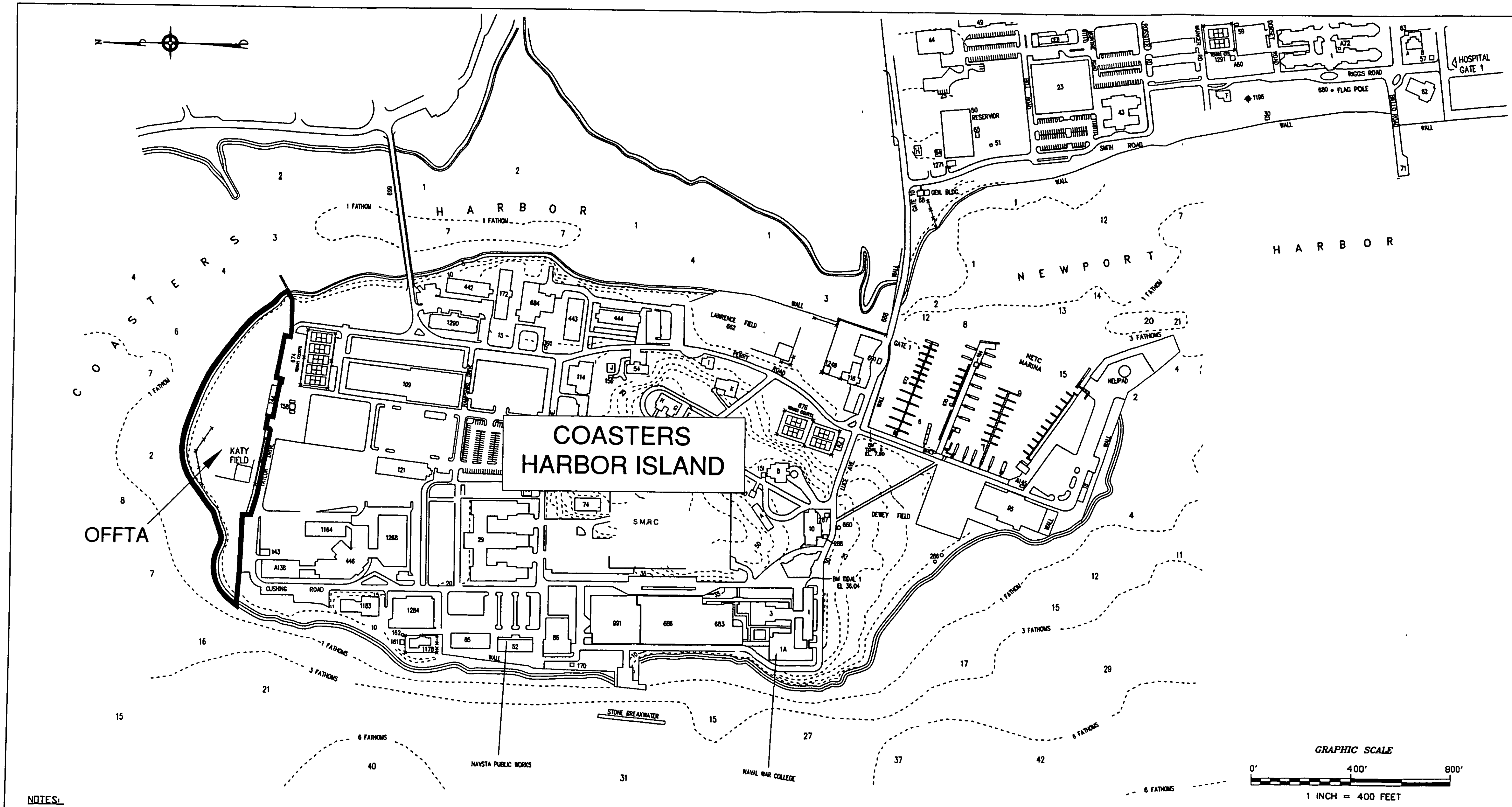
FIGURES



SITE LOCUS		FIGURE 1-1
OLD FIRE FIGHTING TRAINING AREA		TETRA TECH NUS, INC.
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND		55 Jonspin Road Wilmington, MA 01887
DRAWN BY: D.W. MACDOUGALL	REV.: 0	(978)658-7899
CHECKED BY: D. BAXTER	DATE: SEPTEMBER 5, 2000	
SCALE: AS NOTED	ACAD NAME: DWG\5278\0531\FIG_1-1.DWG	



NAVSTA NEWPORT SITES AND STUDY AREAS				FIGURE 1-2
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. McKENNA	DATE:	SEPTEMBER 20, 2000	
SCALE:	AS NOTED	FILE NO.:	DWG\5278\0531\FIG_1-2.DWG	

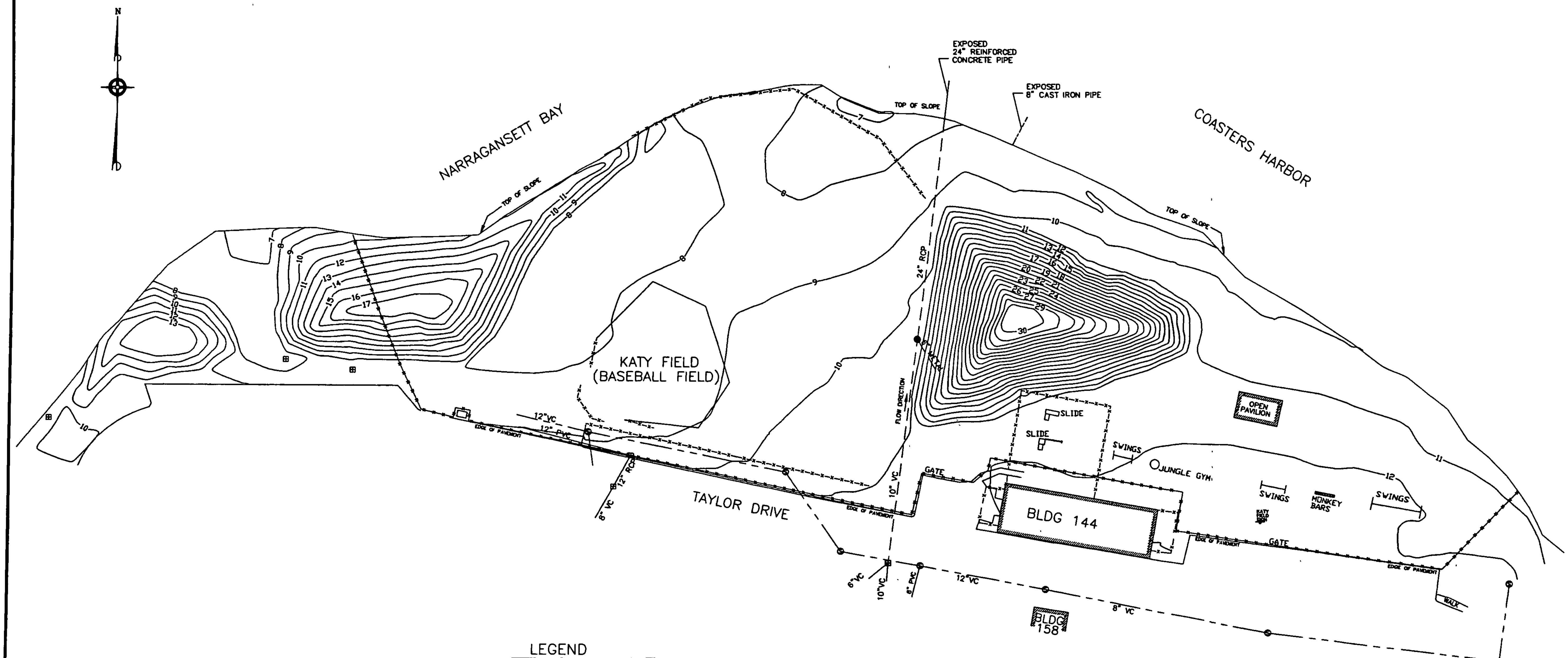


NOTES:

BASE MAP FROM PLAN BY DEPT. OF NAVY, "COASTERS HARBOR ISLAND AND NAVAL HOSPITAL EXISTING CONDITIONS MAP". DATED. 9/98, NETC DWG NO.: 31058-307, CODE ID NO.: 80091, SCALE: 1"=200'.

NARRAGANSETT BAY

OFFTA LOCATION MAP				FIGURE 1-3
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				
DRAWN BY	D.W. MACDOUGALL	REV.:	0	55 Jonspin Road Wilmington, MA 01887
CHECKED BY	D. BAXTER	DATE:	OCTOBER 9, 2000	(978)658-7899
SCALE.	1" = 400'	FILE NO.:	DWG\5278\0531\FIG_1-3.DWG	



LEGEND

⊞	CATCH BASIN
	SIGN
—x—x—x—x	FENCE
—xx—	EXISTING CONTOUR
⊗	SANITARY SEWER MANHOLE
— — —	SANITARY SEWER
⊚	STORM SEWER MANHOLE
— — —	STORM SEWER MANHOLE

NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED 'BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED 'KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

4. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

0' 80' 160'

1 INCH = 80 FEET

SITE PLAN

OLD FIRE FIGHTING TRAINING AREA

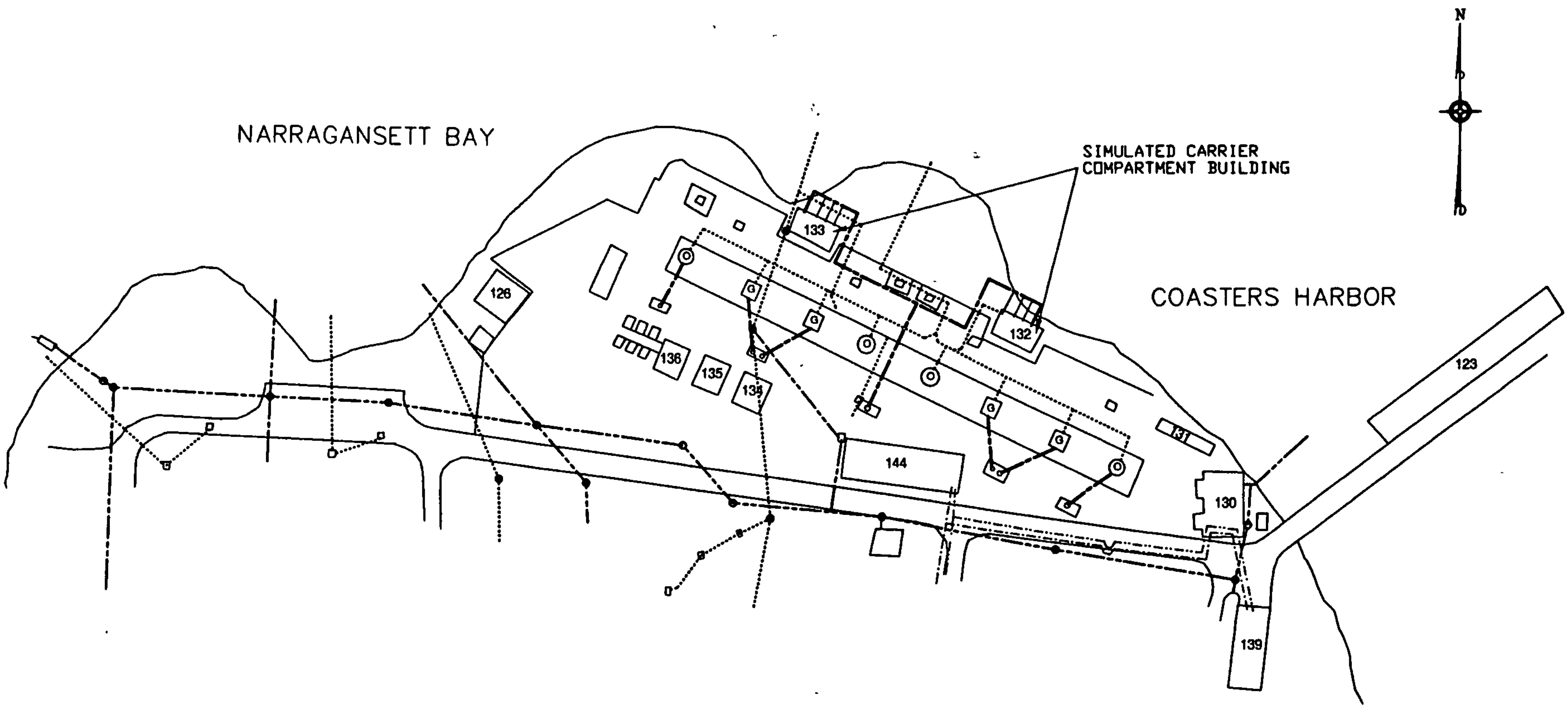
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	OCTOBER 17, 2000
SCALE:	1" = 80'	FILE NO.:	DWG\5278\0531\FIG_1-4.DWG

FIGURE 1–4

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



LEGEND

135 BUILDING AND BUILDING ID

STEAM LINE RETURN

STEAM LINE SUPPLY

STORM SEWER LINE

SANITARY SEWER LINE

OIL LINE

OIL TANKS

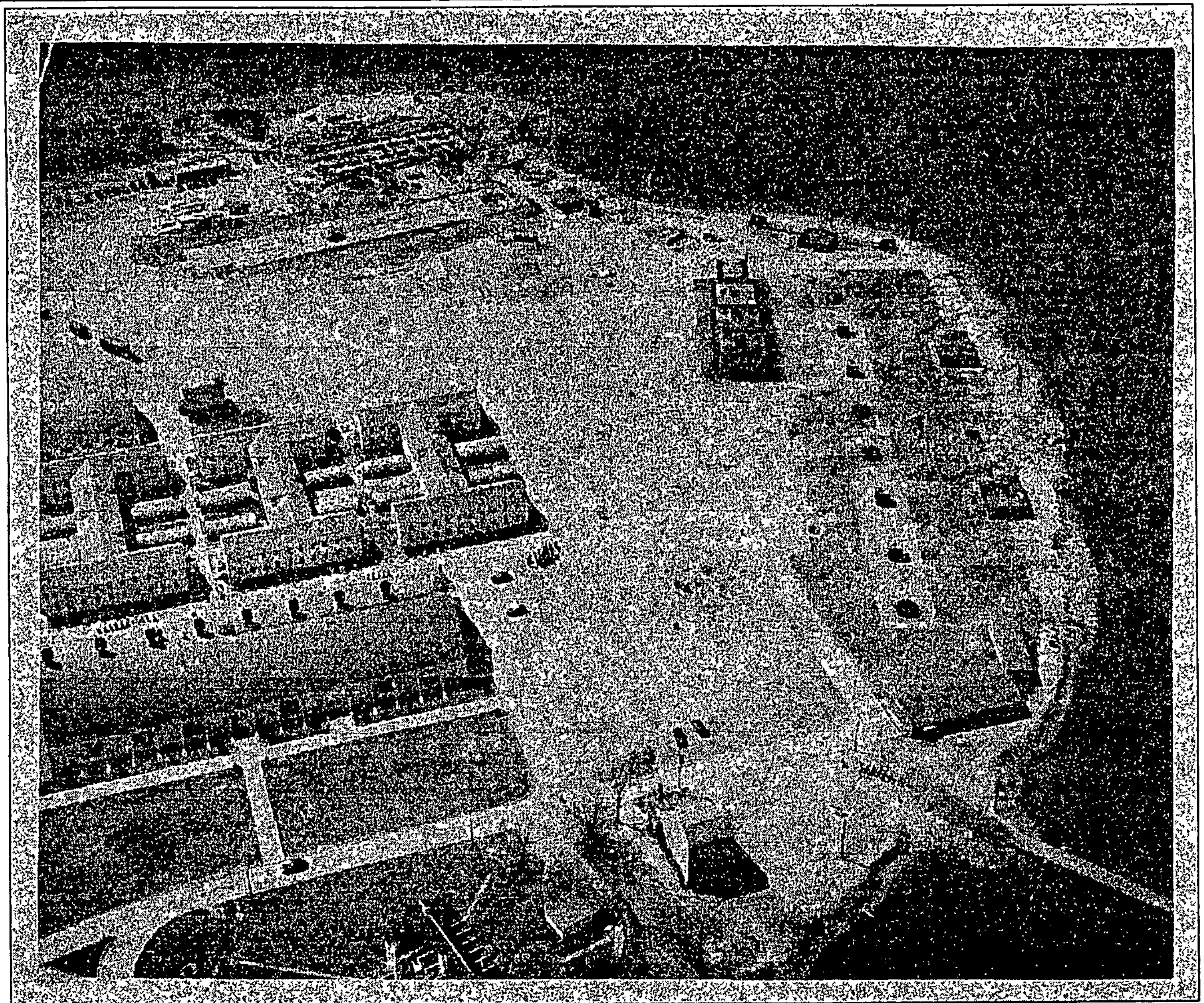
GAS TANKS

SOURCE: MASTER SHORE STATION DEVELOPMENT PLANS, US NAVAL STATION NEWPORT, R. I., 1953

1953 FACILITY DESIGN MAP			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. McKENNA	DATE:	SEPTEMBER 29, 2000
SCALE:	NOT TO SCALE	FILE NO.:	DWG\5278\0531\FIG_1-5.DWG

FIGURE 1-5

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

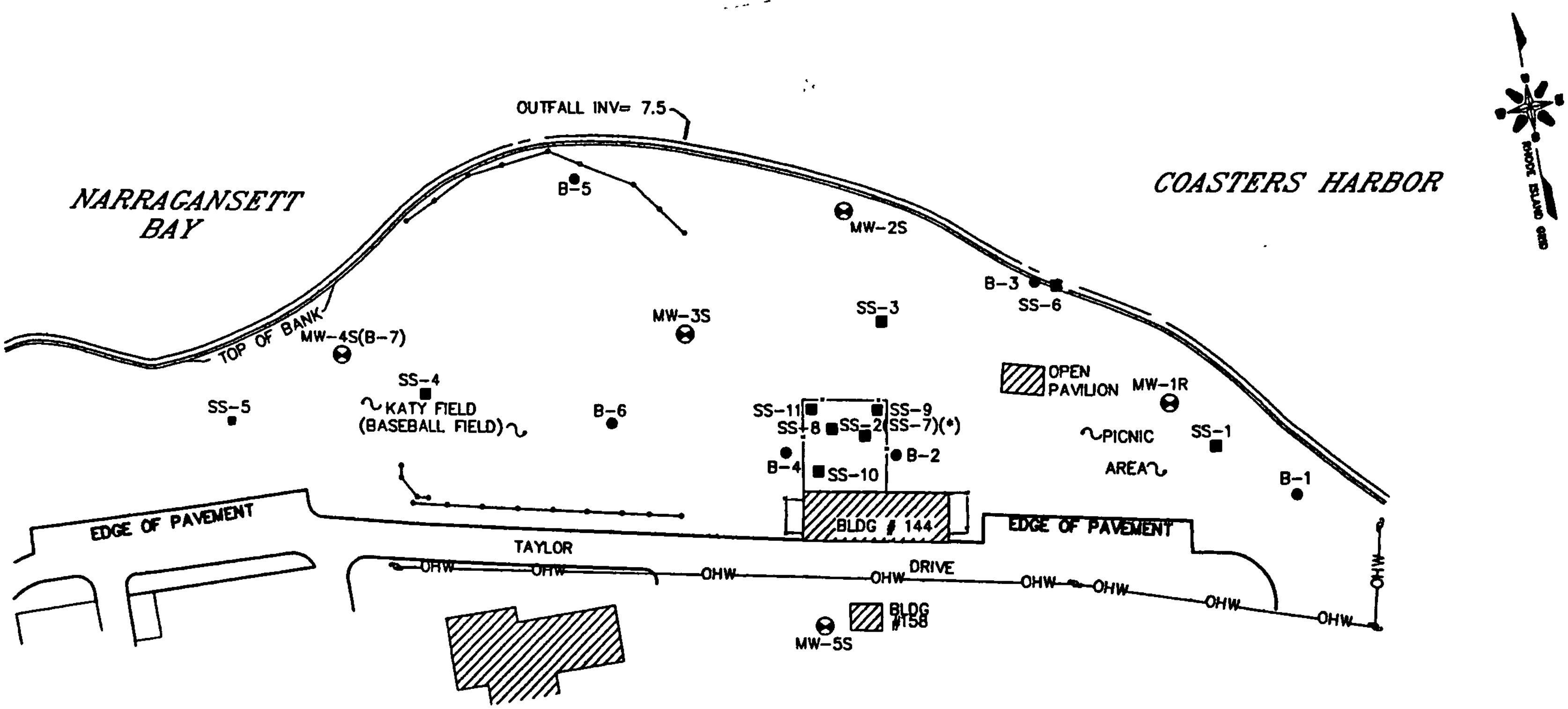


SOURCE: OFFICIAL PHOTOGRAPH; US NAVAL AIR STATION; QUONSET POINT, RHODE ISLAND; NEG NO. 5979; DATE - MAY 1, 1944.

1944 AERIAL PHOTO - COASTERS HARBOR ISLAND			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV:	0
CHECKED BY:	D. BAXTER	DATE:	AUGUST 28, 2000
SCALE:	NOT TO SCALE	FILE NO:	DWG\5278\0531\FIG_1-6.DWG

FIGURE 1-6

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899



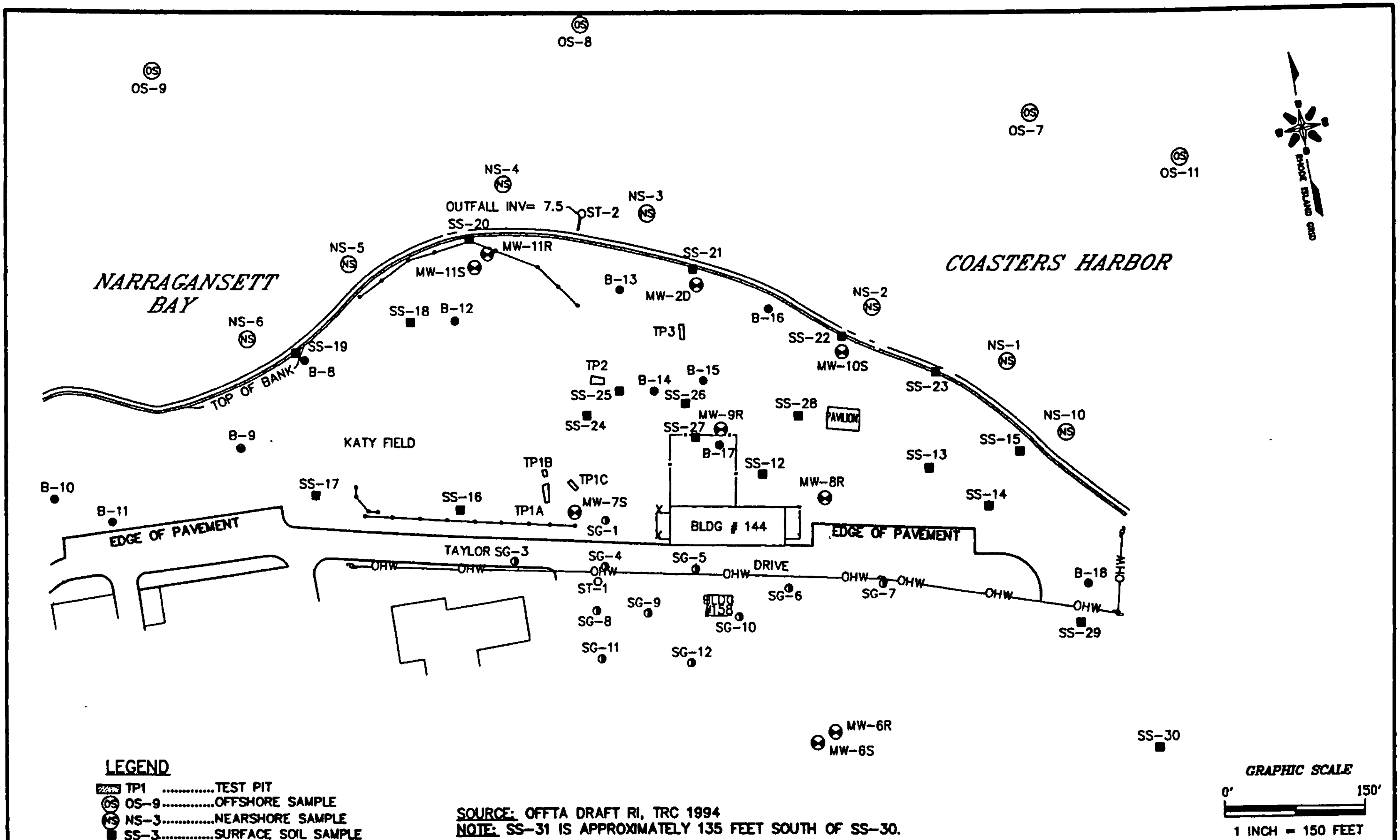
(*)-NOTE: SAMPLE SS-7 WAS COLLECTED FROM THE SAME LOCATION AS SS-2 IN THE FOLLOW-UP PHASE I RI SAMPLING REQUESTED BY THE EPA.

GRAPHIC SCALE
0' 150'
1 INCH = 150 FEET

LEGEND
- ■ SS-3............SURFACE SOIL SAMPLE
- ● B-5.............TEST BORING
- MW-3............MONITORING WELL
- ....FENCE LINE
- OHW ....OVERHEAD WIRES
- ....UTILITY POLE
- ....CHAIN LINK FENCE

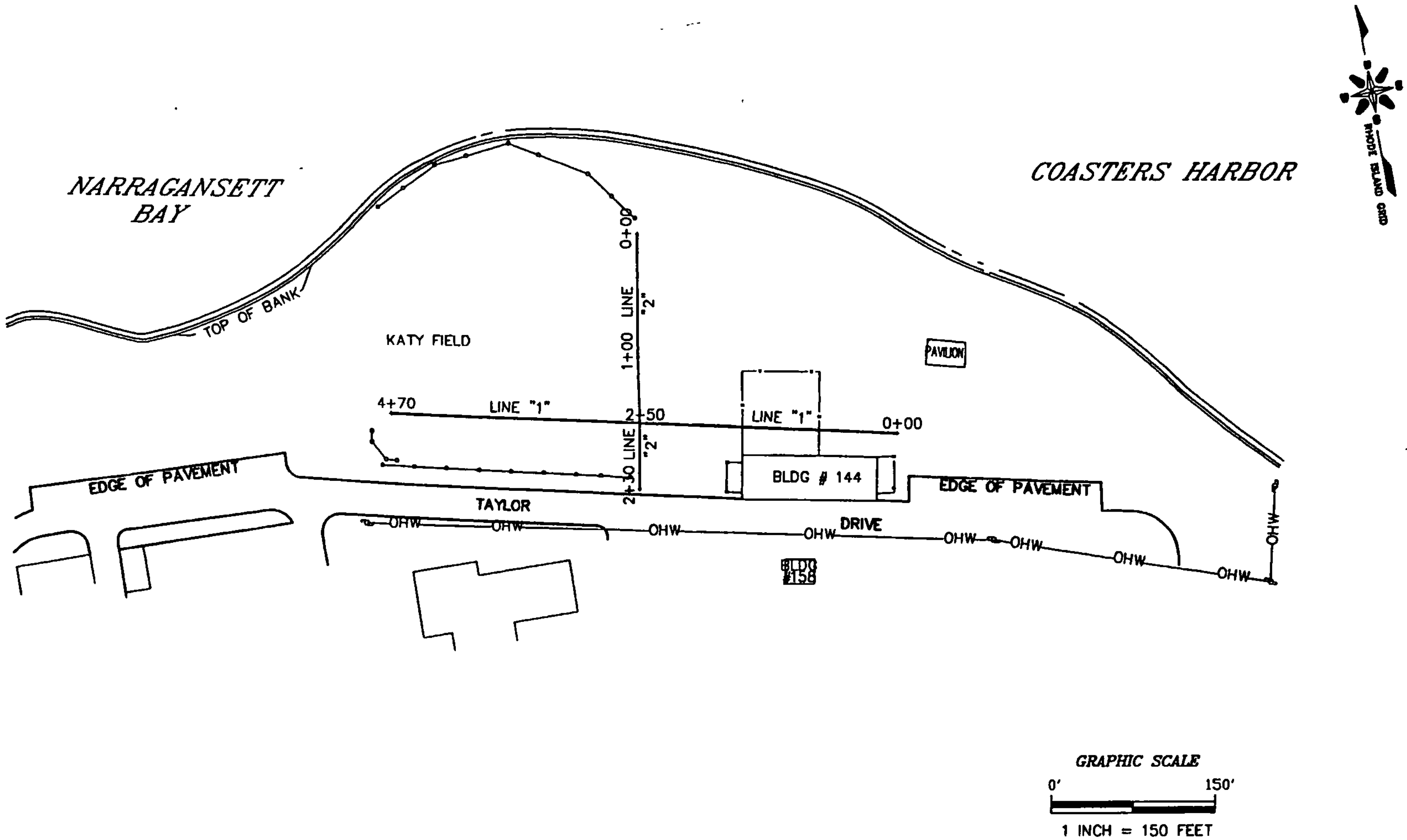
SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE I INVESTIGATION SUMMARY				FIGURE 2-1
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000	
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-1.DWG	



SOURCE: OFFTA DRAFT RI, TRC 1994
NOTE: SS-31 IS APPROXIMATELY 135 FEET SOUTH OF SS-30.

PHASE II INVESTIGATION SUMMARY				FIGURE 2-2
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	55 Jonspin Road Wilmington, MA 01887
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 25, 2000	(978)658-7899
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-2.DWG	



LEGEND

—•—	FENCE LINE
—OHW—	OVERHEAD WIRES
	UTILITY POLE
o—o	CHAIN LINK FENCE
4+70	SEISMIC LINE

SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE II SEISMIC REFRACTION SURVEY LINES

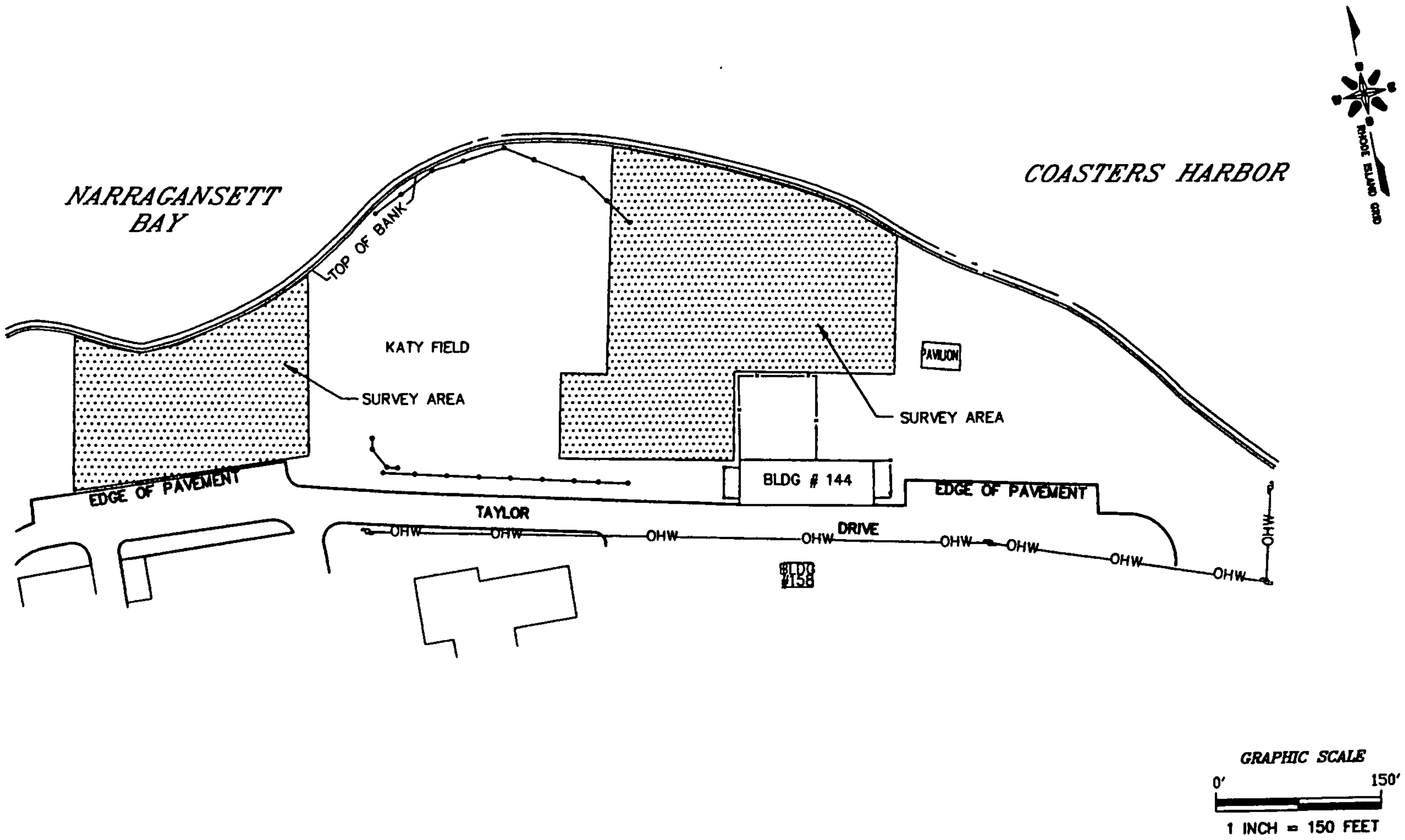
OLD FIRE FIGHTING TRAINING AREA

NAVSTA NEWPORT – NEWPORT, RHODE ISLAND

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	OCTOBER 3, 2000
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0555\FIG_2-3.DWG

FIGURE 2-3

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899



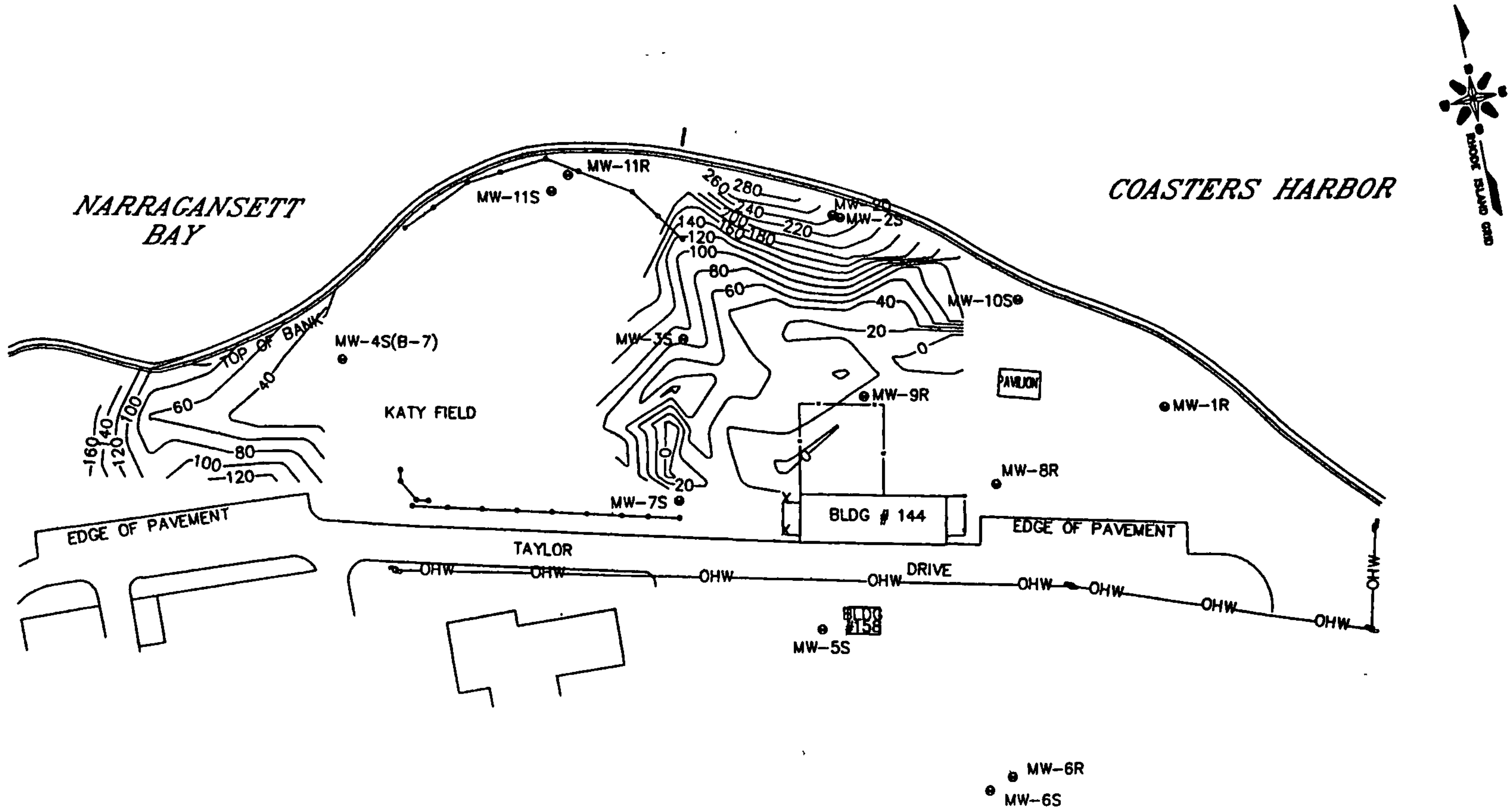
SOURCE: OFFTA DRAFT RI, TRC 1994

LEGEND

- ....FENCE LINE
- ....OVERHEAD WIRES
- ....UTILITY POLE
- .... CHAIN LINK FENCE
- ....SURVEY AREA

PHASE II EM-31 AND MAGNETOMETER SURVEY AREA MAP	FIGURE 2-4
OLD FIRE FIGHTING TRAINING AREA	TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND	55 Jonspin Road Wilmington, MA 01887 (978)658-7899

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-4.DWG



NOES:
1. THE SURVEY WAS CONDUCTED ON OCTOBER 26, 1993 WITH A GEONICS EM-31.
2. CONDUCTIVITY VALVES OF 78 MMHOS/M AND 79 MMHOS/M WERE OBSERVED AT THE BASE STATION AT THE START AND END OF SURVEY, RESPECTIVELY.

LEGEND

40 ——— ............CONDUCTIVITY CONTOUR (MMHOS/M)
● MW-3............MONITORING WELL
............FENCE LINE
—OHW— ....OVERHEAD WIRES
............UTILITY POLE
............CHAIN LINK FENCE

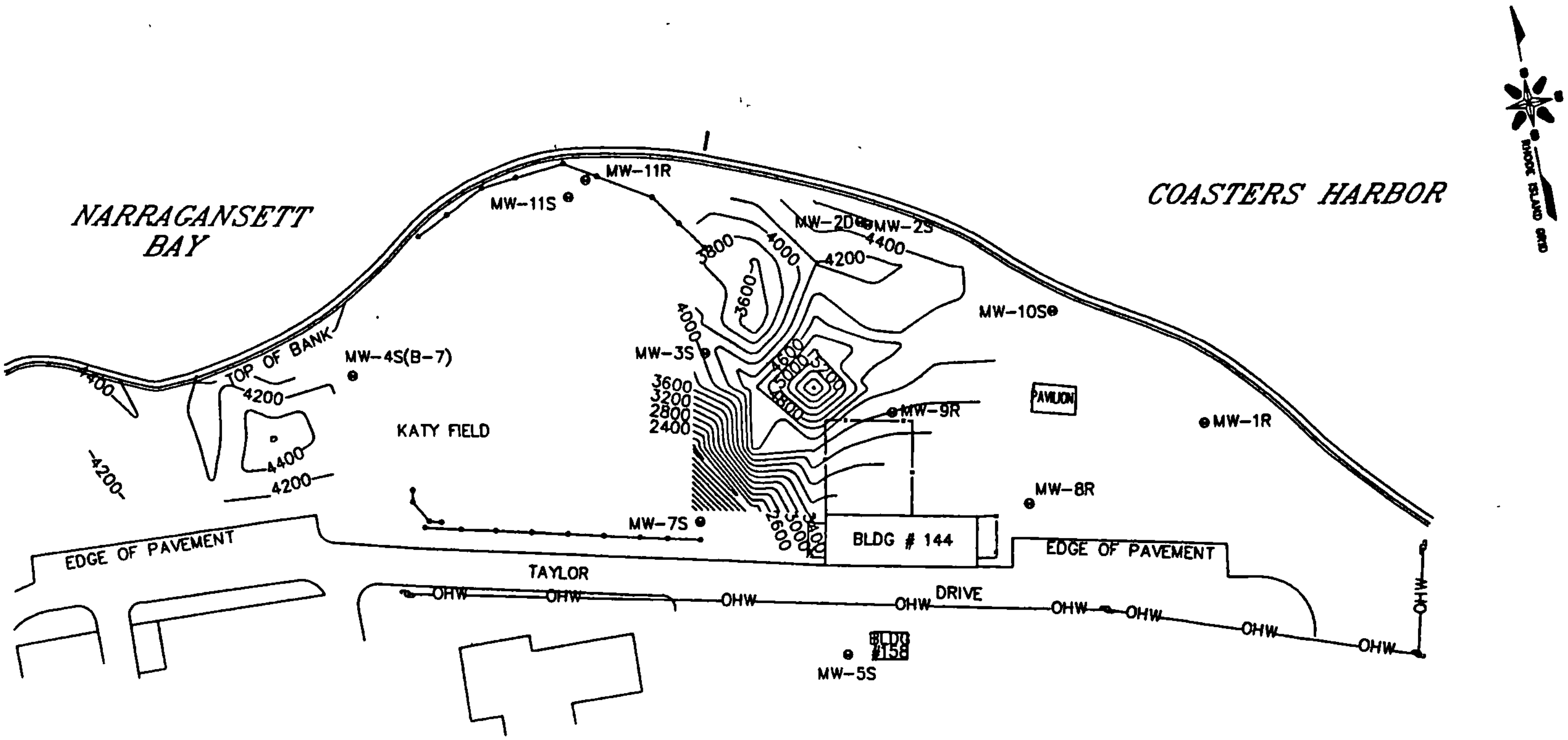
SOURCE: OFFTA DRAFT RI, TRC 1994

GRAPHIC SCALE

0' 150'

1 INCH = 150 FEET

ELECTROMAGNETIC CONDUCTIVITY CONTOUR MAP				FIGURE 2-5
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000	
SCALE:	1" = 150'	FILE NO.: DWG\5278\0531\FIG_2-5.DWG		



NOTES:

1. CONTOUR INTERVAL: 200 GAMMAS. ACTUAL VALVES ARE PLUS 50,000 GAMMAS.
2. THE SURVEY WAS CONDUCTED ON OCTOBER 26, 1993 WITH A GEOMETRICS G-846 MAGNETOMETER.
3. MAGNETIC VALVES OF 54,097 GAMMAS AND 54,099 GAMMAS WERE OBSERVED AT THE BASE STATION AT THE START AND END OF SURVEY, RESPECTIVELY.

SOURCE: OFFTA DRAFT RI, TRC 1994

GRAPHIC SCALE

0' 150'

1 INCH = 150 FEET

LEGEND

4000 ....MAGNETIC CONTROL (-50,000 GAMMAS)

MW-3............MONITORING WELL

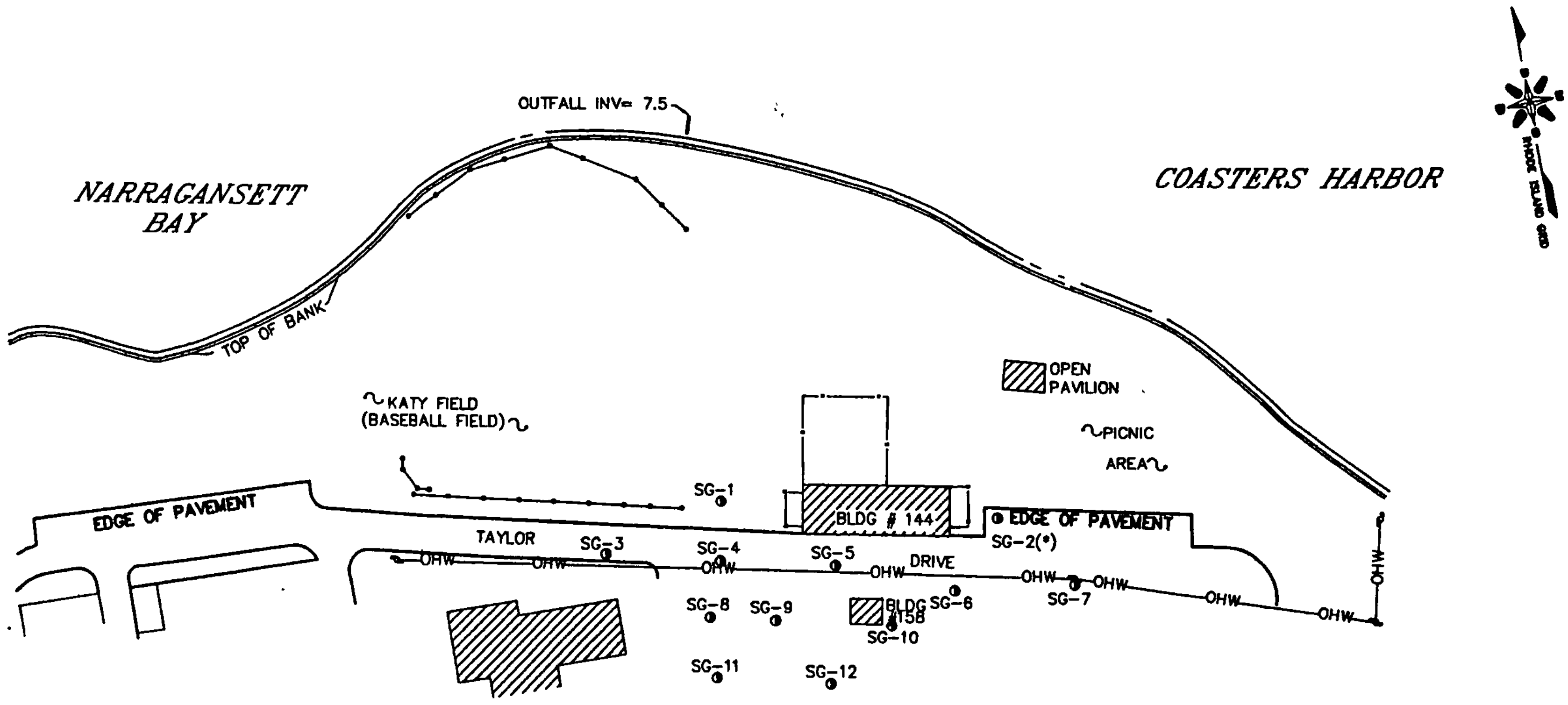
............FENCE LINE

OHW ....OVERHEAD WIRES

............UTILITY POLE

.... CHAIN LINK FENCE

MAGNETIC CONTOUR MAP		FIGURE 2-6
OLD FIRE FIGHTING TRAINING AREA		TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND		
DRAWN BY: D.W. MACDOUGALL	REV.: 0	55 Jonspin Road Wilmington, MA 01887
CHECKED BY: D. BAXTER	DATE: SEPTEMBER 21, 2000	(978)658-7899
SCALE: 1" = 150'	FILE NO.: DWG\5278\0531\FIG_2-6.DWG	



LEGEND

SG-3 ....SOIL GAS SAMPLE
............FENCE LINE
OHW ....OVERHEAD WIRES
............UTILITY POLE
.... CHAIN LINK FENCE

(*)-NOTE: THIS SHOWS THE APPROXIMATE LOCATION WHERE SOIL GAS POINT SG-2 WAS ATTEMPTED. HOWEVER THE STONY SUBSURFACE MATERIALS ENCOUNTERED DID NOT ALLOW FOR COMPLETION OF THIS POINT.

SOURCE: OFFTA DRAFT RI, TRC 1994

GRAPHIC SCALE

0' 150'

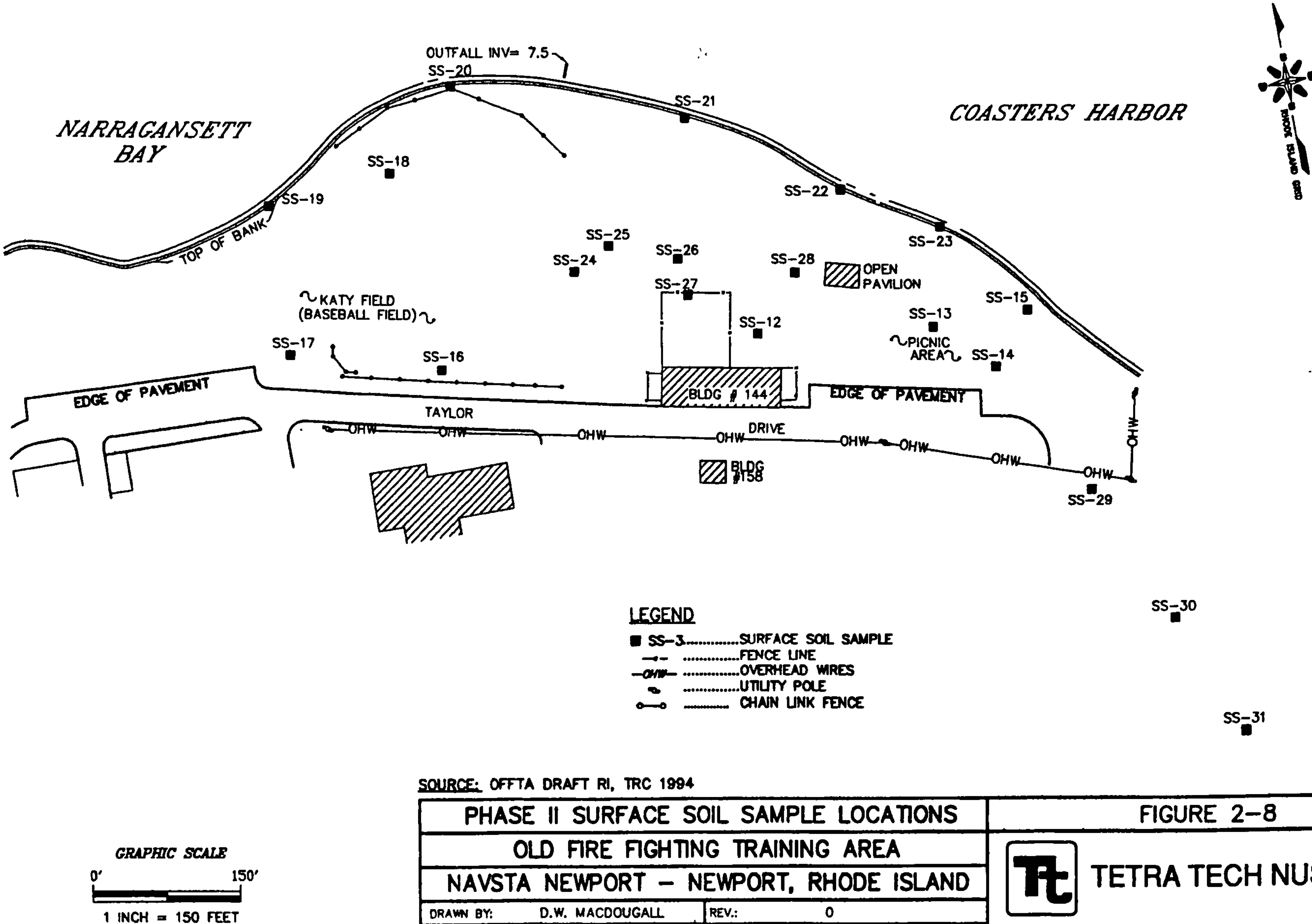
1 INCH = 150 FEET

PHASE II SOIL GAS SAMPLE LOCATIONS			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-7.DWG

FIGURE 2-7

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE II SURFACE SOIL SAMPLE LOCATIONS

OLD FIRE FIGHTING TRAINING AREA

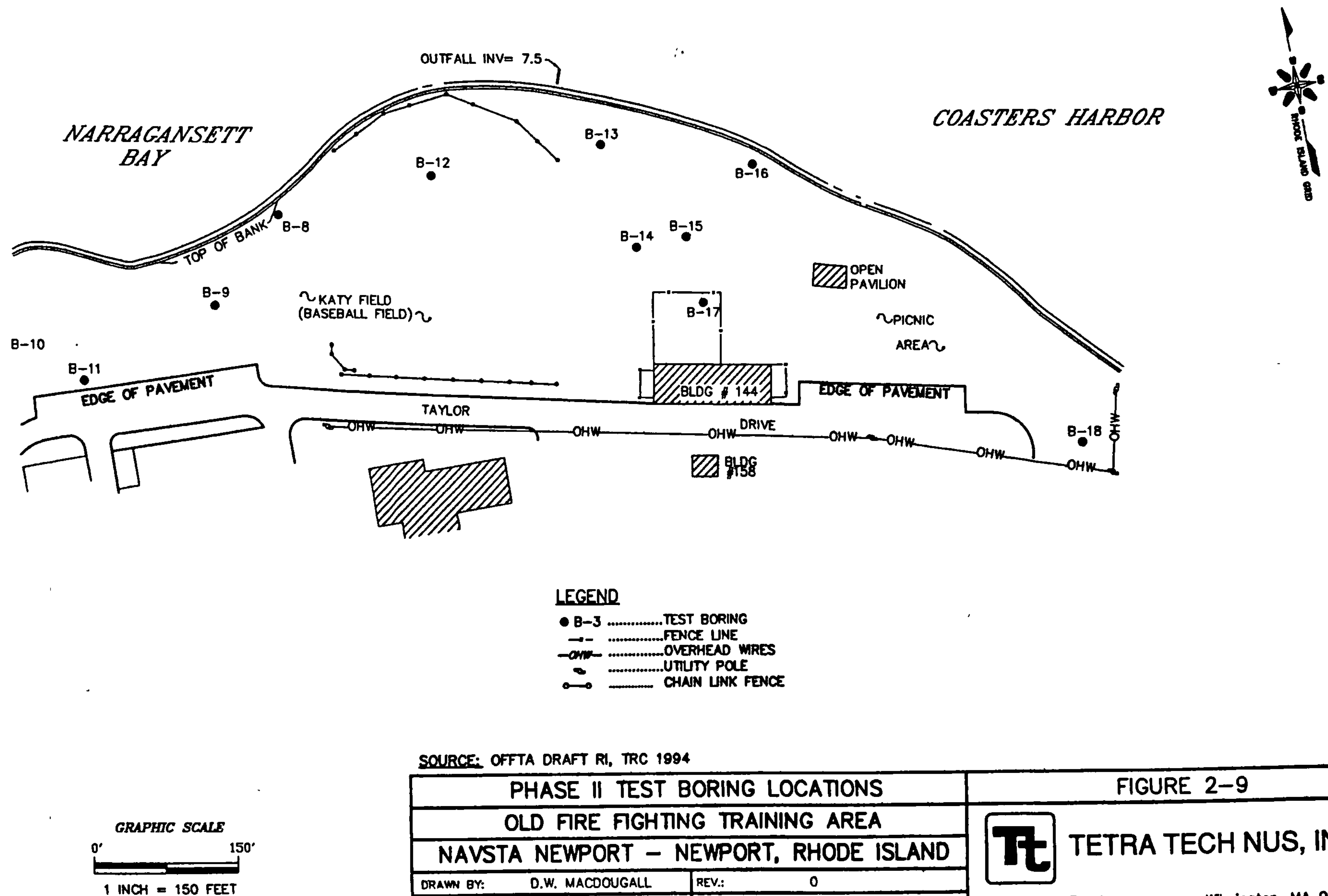
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-8.DWG

FIGURE 2-8

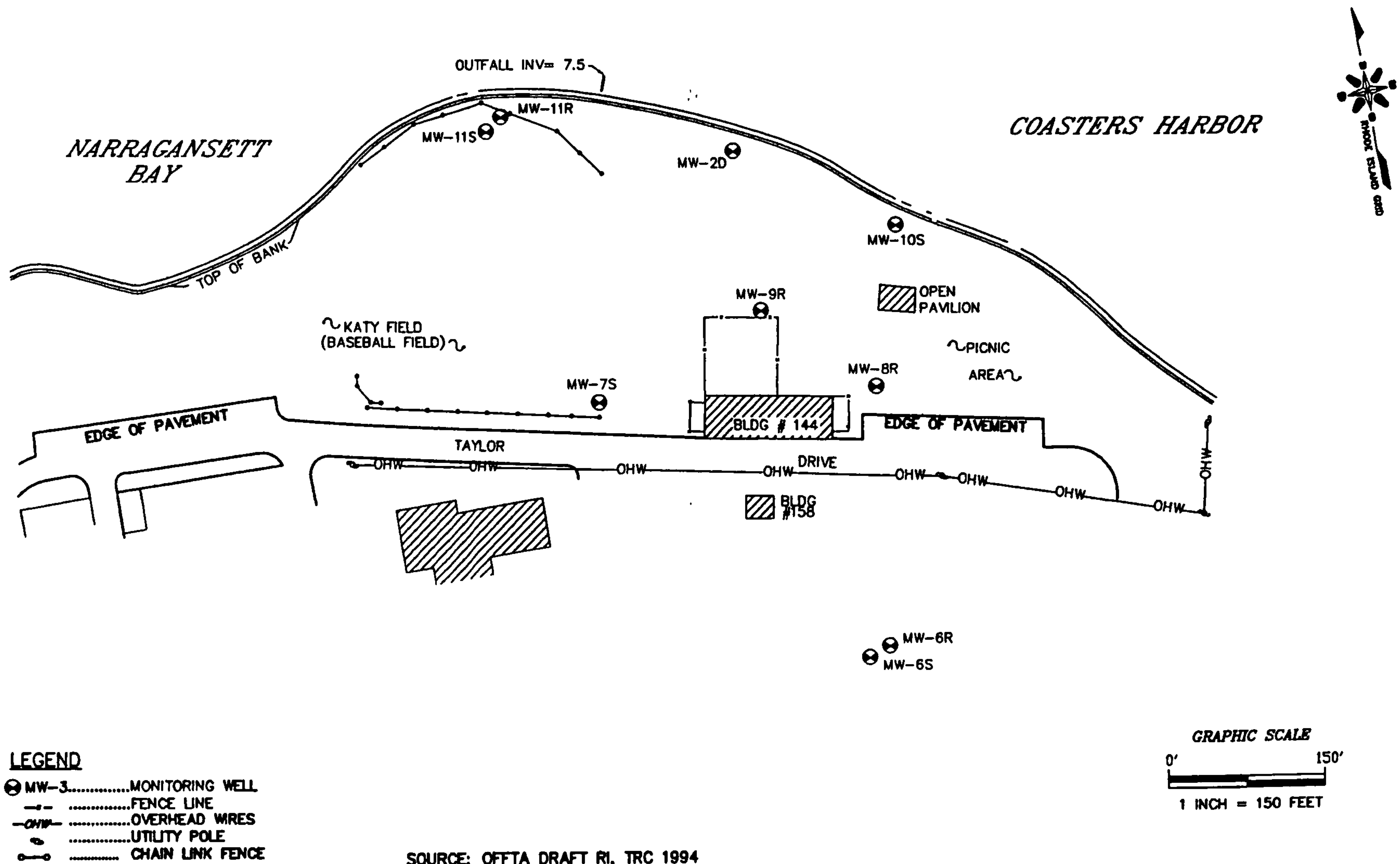
TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



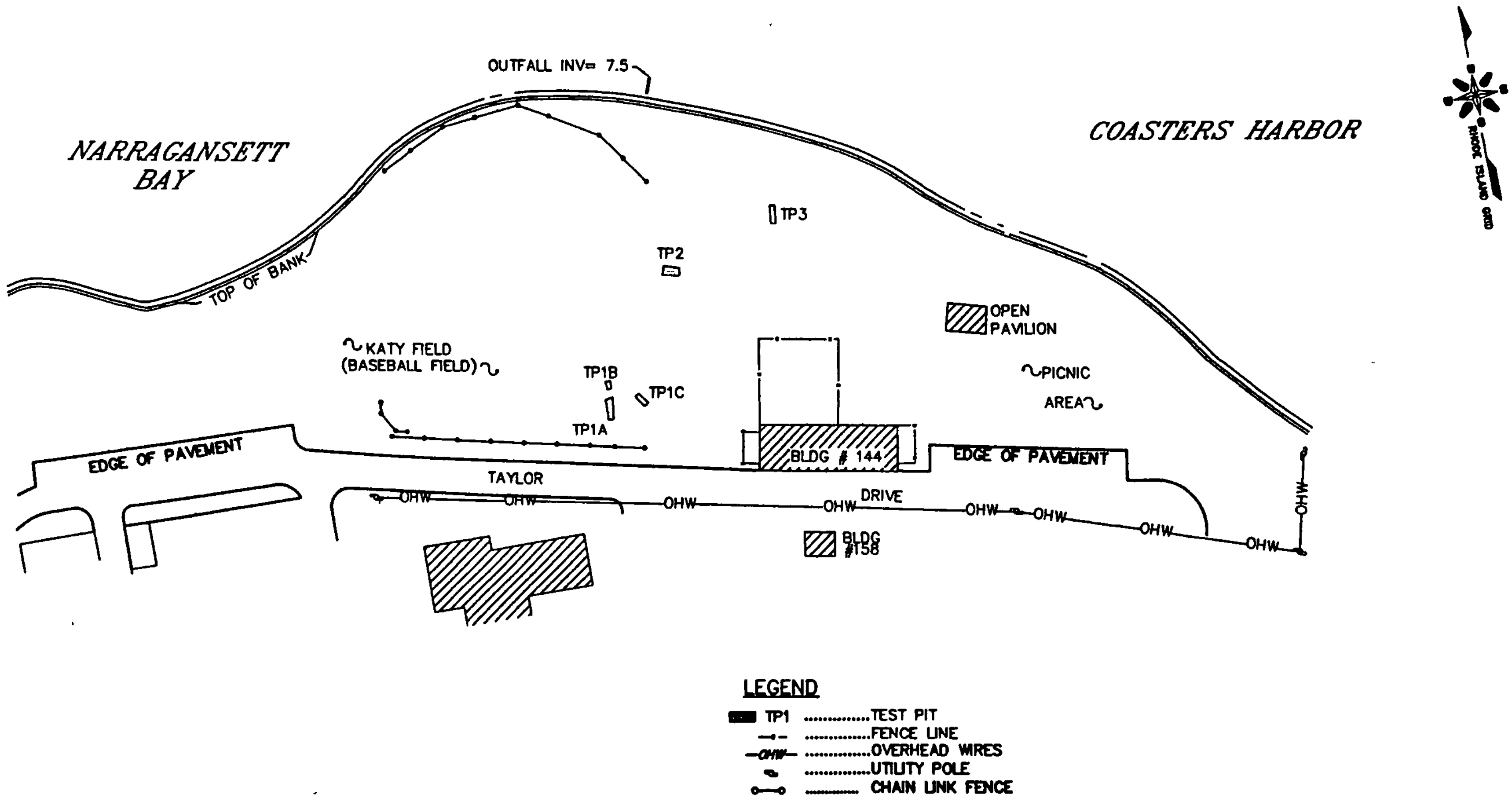
SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE II TEST BORING LOCATIONS				FIGURE 2-9
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	55 Jonspin Road Wilmington, MA 01887 (978)658-7899
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000	
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-9.DWG	



SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE II MONITORING WELL LOCATIONS			FIGURE 2-10
OLD FIRE FIGHTING TRAINING AREA			TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY: D.W. MACDOUGALL	REV.: 0		
CHECKED BY: D. BAXTER	DATE: SEPTEMBER 21, 2000		
SCALE: 1" = 150'	FILE NO.: DWG\5278\0531\FIG_2-10.DWG		



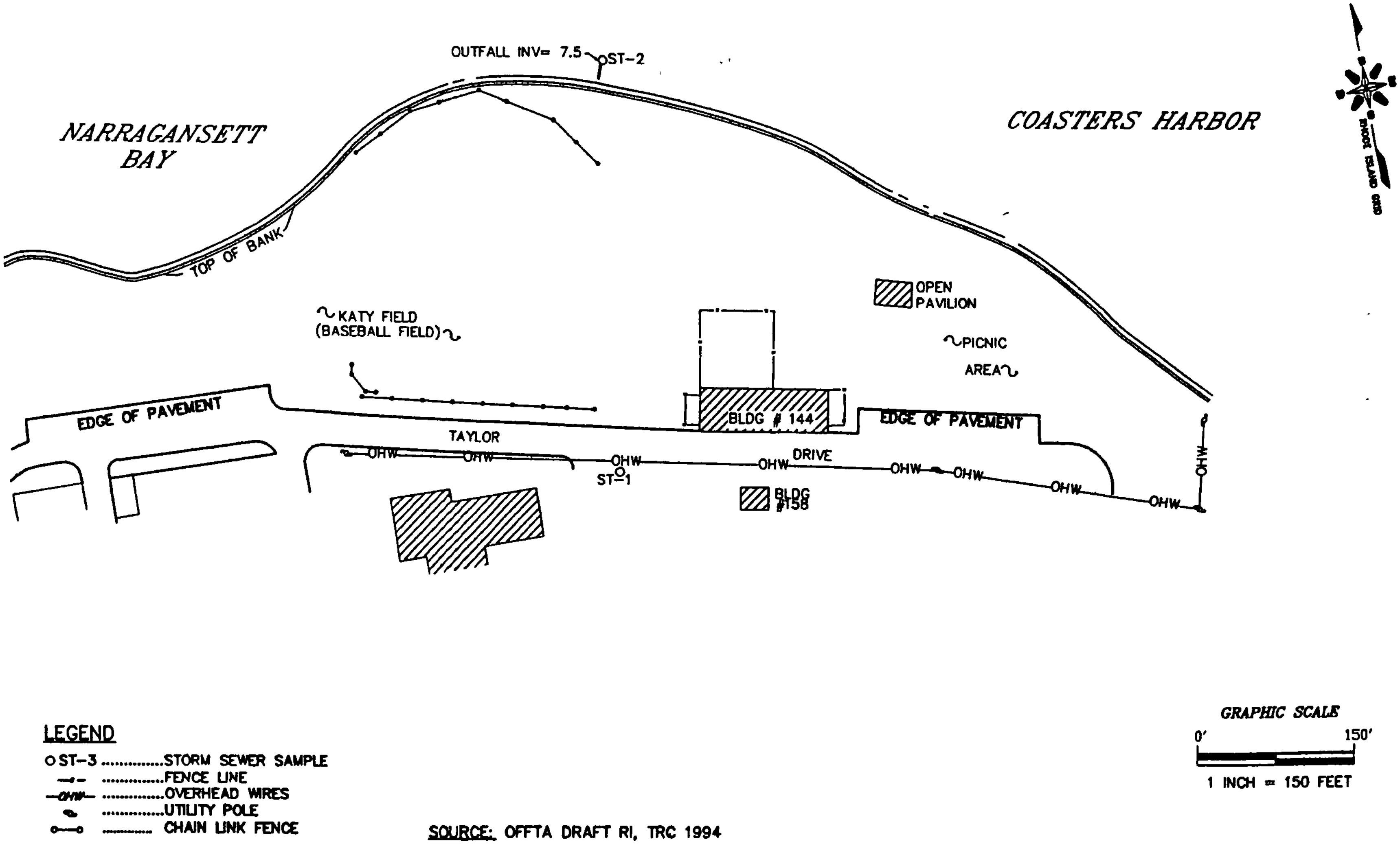
SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE II TEST PIT LOCATIONS				FIGURE 2-11
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 25, 2000	
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-11.DWG	

GRAPHIC SCALE

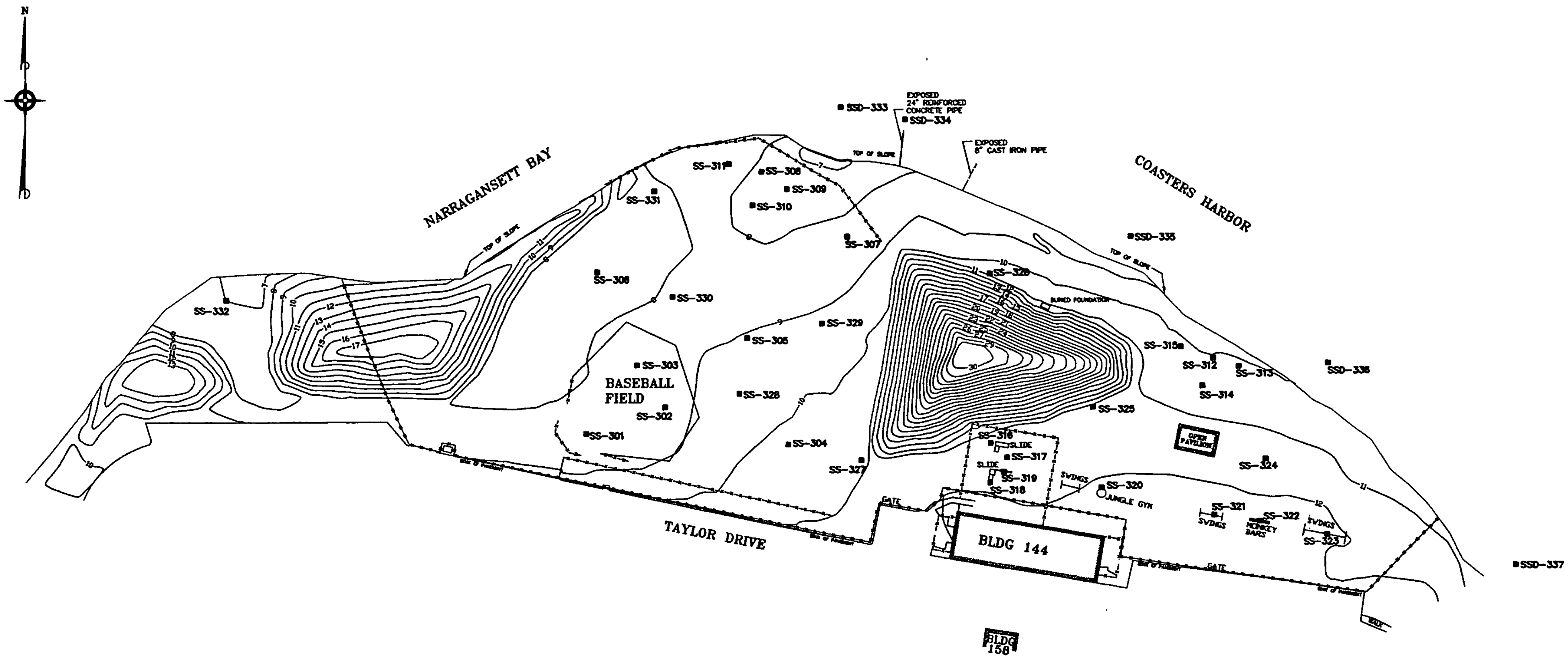
0' 150'

1 INCH = 150 FEET



SOURCE: OFFTA DRAFT RI, TRC 1994

PHASE II STORM SEWER SAMPLE LOCATIONS				FIGURE 2-12
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000	55 Jonspin Road Wilmington, MA 01887
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0531\FIG_2-12.DWG	(978)658-7899



LEGEND

■ SS-325	SURFACE SOIL SAMPLE LOCATIONS WITH IDENTIFIER (TtNUS, 11/98)
■ SSD-337	SHORELINE SEDIMENT SAMPLE LOCATIONS WITH IDENTIFIER (TtNUS, 11/98)
—■—■—■—	FENCE
—— XX ——	EXISTING CONTOUR

NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO 7578 CTO 288, BY BROWN & ROOT ENVIRONMENTAL. SOURCE. BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

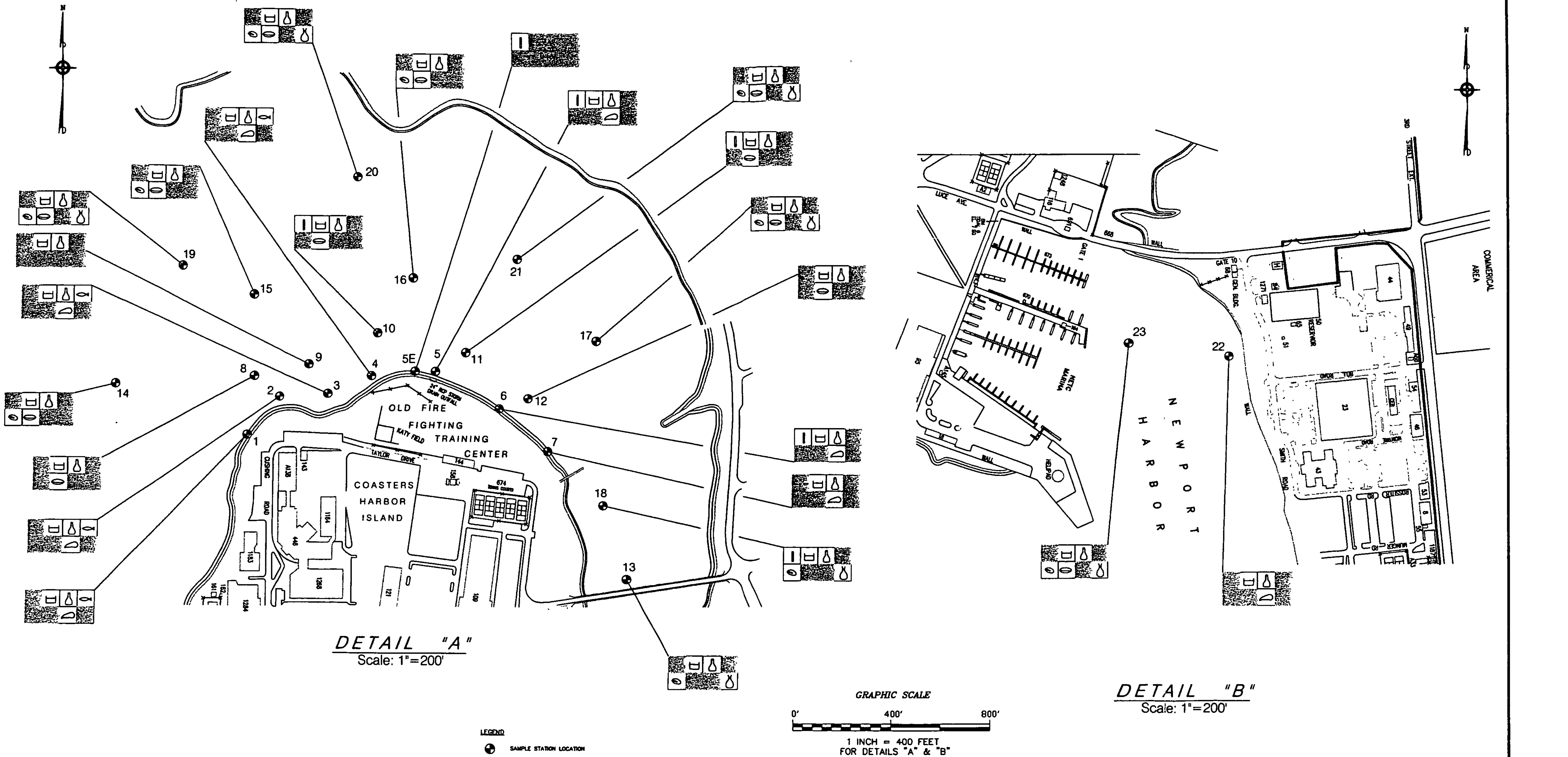
2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

GRAPHIC SCALE

0' 100' 200'

1 INCH = 100 FEET

PHASE III SURFACE SOIL AND SEDIMENT SAMPLE LOCATIONS				FIGURE 2-14
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000	
SCALE:	1" = 100'	FILE NO.:	DWG\5278\0531\FIG_2-14.DWG	



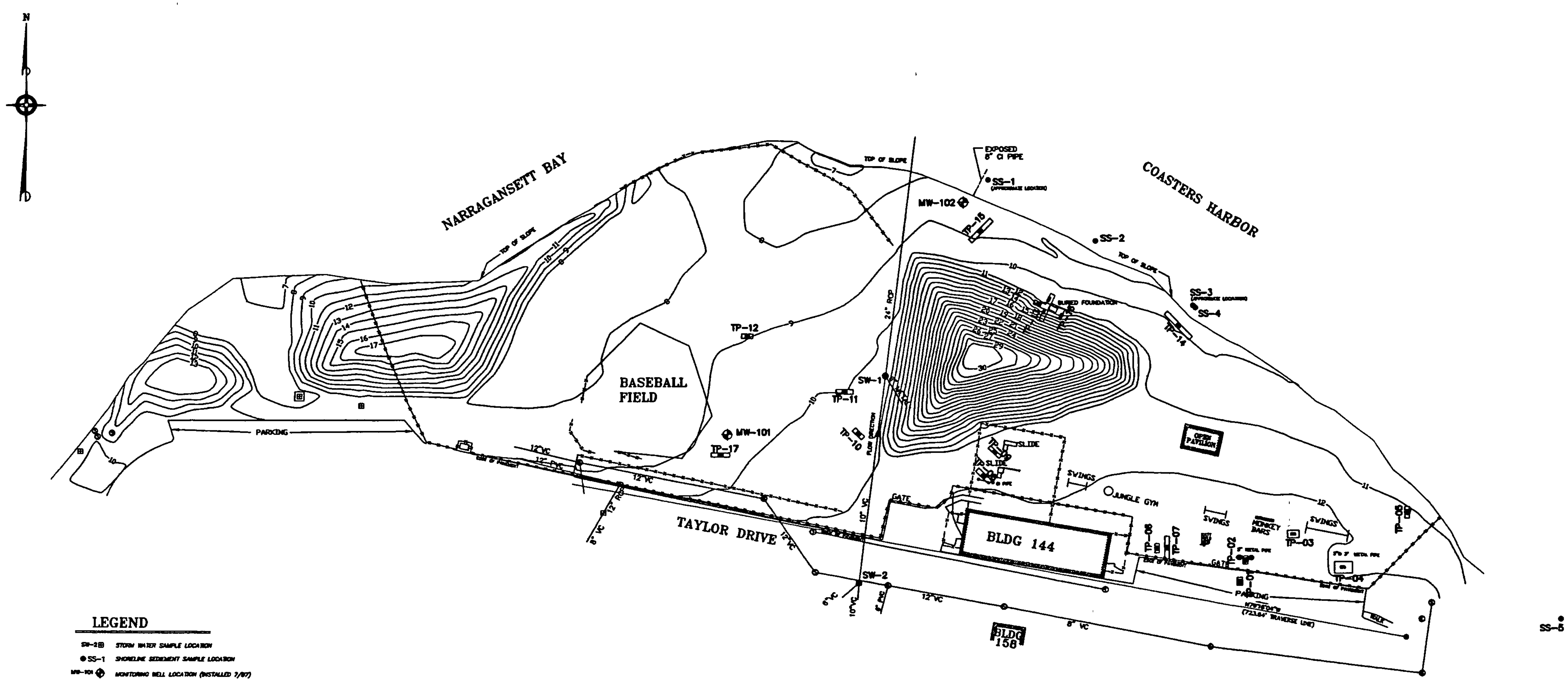
LEGEND

- SAMPLE STATION LOCATION
- SURFACE SEDIMENT (0–15 cm.)
- DEEP SEDIMENT (VARIOUS – SEE TEXT)
- SEDIMENT ELUTRIATE AND PORE WATER
- FINFISH
- LOBSTER
- HARD CLAMS
- BLUE MUSSELS
- DEPLOYED MUSSELS
- SAMPLES NOT DEPICTED INDICATES SAMPLES NOT COLLECTED FOR THIS MEDIA

NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SAMPLE STATIONS LOCATED BY GPS, DONE BY URI IN APRIL, 1998.
4. LOCATION OF SHORELINE IS APPROXIMATE MHW; SAMPLE STATIONS 1 – 7 WERE LOCATED AT ACTUAL LOW TIDE LINE AS DEFINED BY URI MARINE SCIENTISTS IN APRIL, 1998.
5. LOCATION OF 24" RCP CULVERT NEAR STATION 5 BY VISUAL INSPECTION; LOCATION TO BE CONSIDERED APPROXIMATE.

OFFSHORE ERA SAMPLE LOCATIONS OLD FIRE FIGHTING TRAINING AREA NAVSTA NEWPORT – NEWPORT, RHODE ISLAND		FIGURE 2–15
DRAWN BY: D.W. MACDOUGALL	REV.: 0	TETRA TECH NUS, INC. 55 Jonspin Road Wilmington, MA 01887 (978)658-7899
CHECKED BY: S. PARKER	DATE: OCTOBER 4, 2000	
SCALE: 1" = 400'	FILE NO: DWG\5278\0531\FIG_2-15A.DWG	



LEGEND

- SW-2 STORM WATER SAMPLE LOCATION
- SS-1 SHORELINE SEDIMENT SAMPLE LOCATION
- MW-101 MONITORING WELL LOCATION (INSTALLED 7/97)
- TP-01 TEST PIT LOCATION (OUTER BOX INDICATES APPROXIMATE LIMIT OF TEST PIT)
- PVC POLYVINYL CHLORIDE PIPE
- VC VITRIFIED CLAY PIPE
- CI CAST IRON PIPE
- CATCH BASIN
- DRAIN MANHOLE
- ELECTRIC MANHOLE
- SANITARY SEWER MANHOLE
- TELEPHONE MANHOLE
- FENCE
- XX EXISTING CONTOUR

GRAPHIC SCALE

0' 100' 200'

1 INCH = 100 FEET

NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL. SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRWAING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

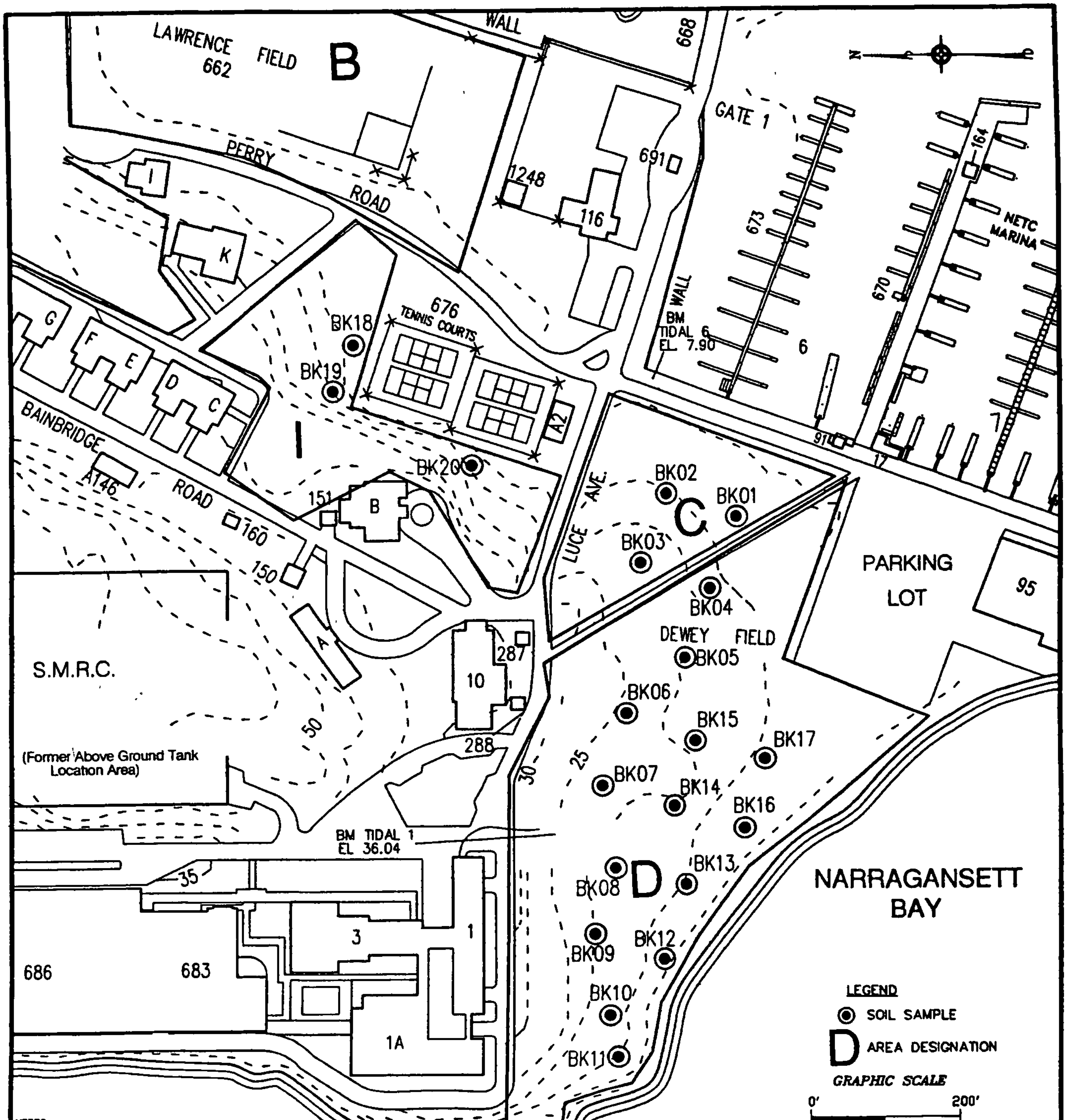
2 HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVEL BASE MEAN LOW WATER.

SOURCE REMOVAL EVALUATION SAMPLE LOCATIONS			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000
SCALE:	1" = 100'	FILE NO.:	DWG\5278\0531\FIG_2-13.DWG

FIGURE 2–13

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



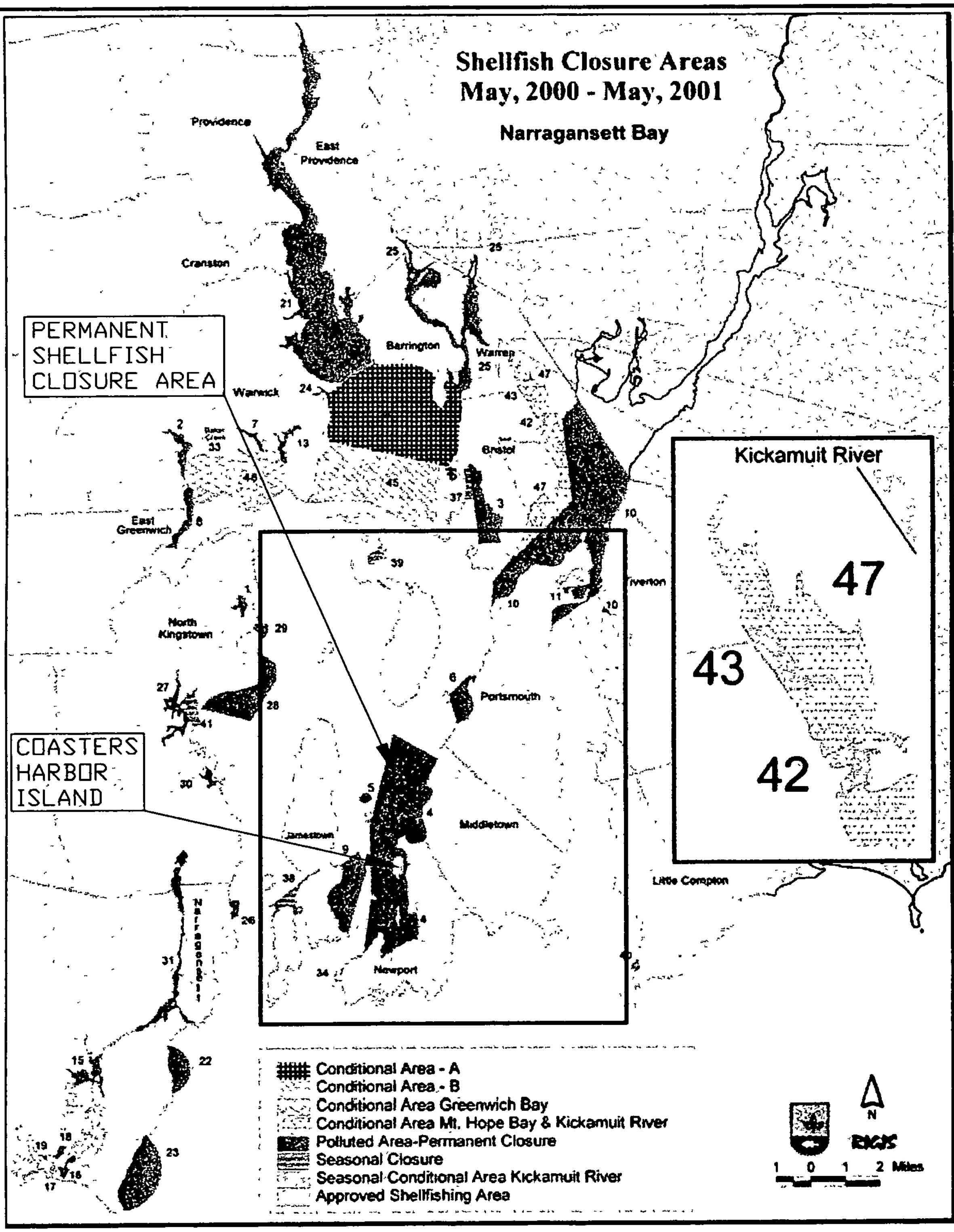
NOTES:
1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. BASE MAP FROM PLAN BY DEPT. OF NAVY, "COASTERS HARBOR ISLAND AND NAVAL HOSPITAL EXISTING CONDITIONS MAP", DATED: 9/98, NETC DWG NO.: 31058-307, CODE ID NO.: 80091, SCALE: 1"=200'.

BACKGROUND SOIL SAMPLE LOCATIONS
OLD FIRE FIGHTING TRAINING AREA
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	SEPTEMBER 21, 2000
SCALE:	1" = 200'	ACAD NAME:	DWG\5278\0531\FIG_2-16.DWG

FIGURE 2–16

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

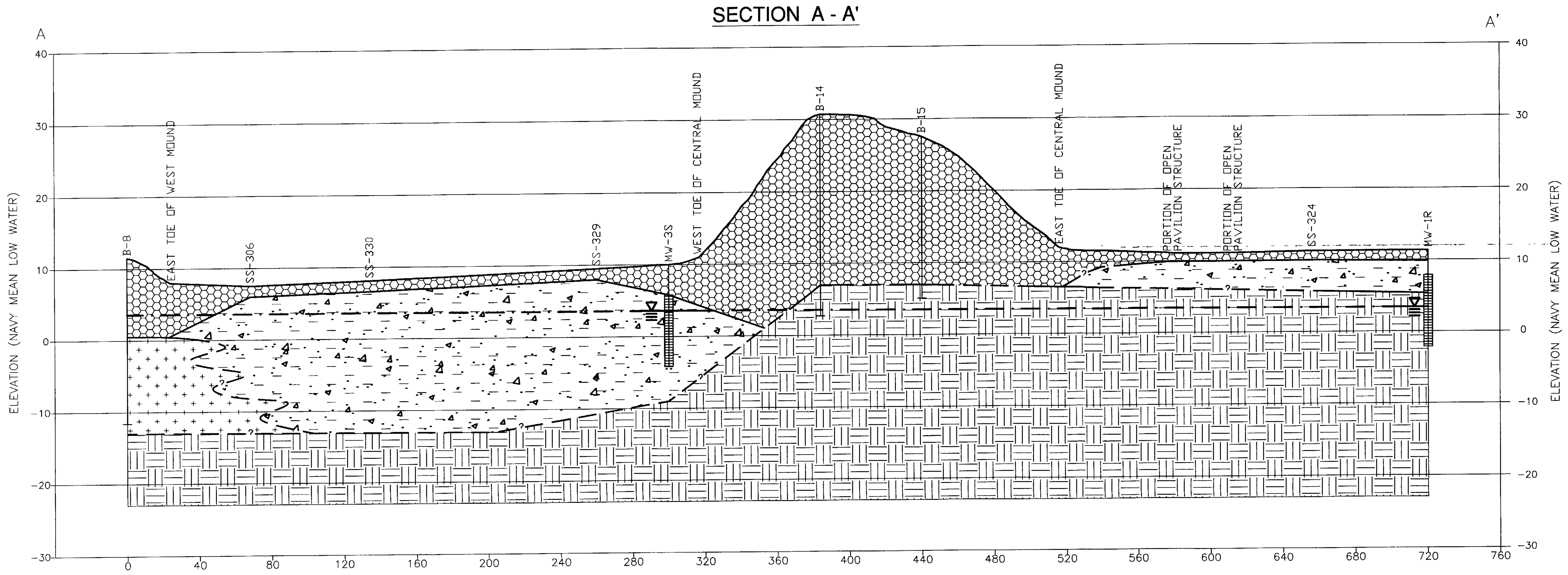


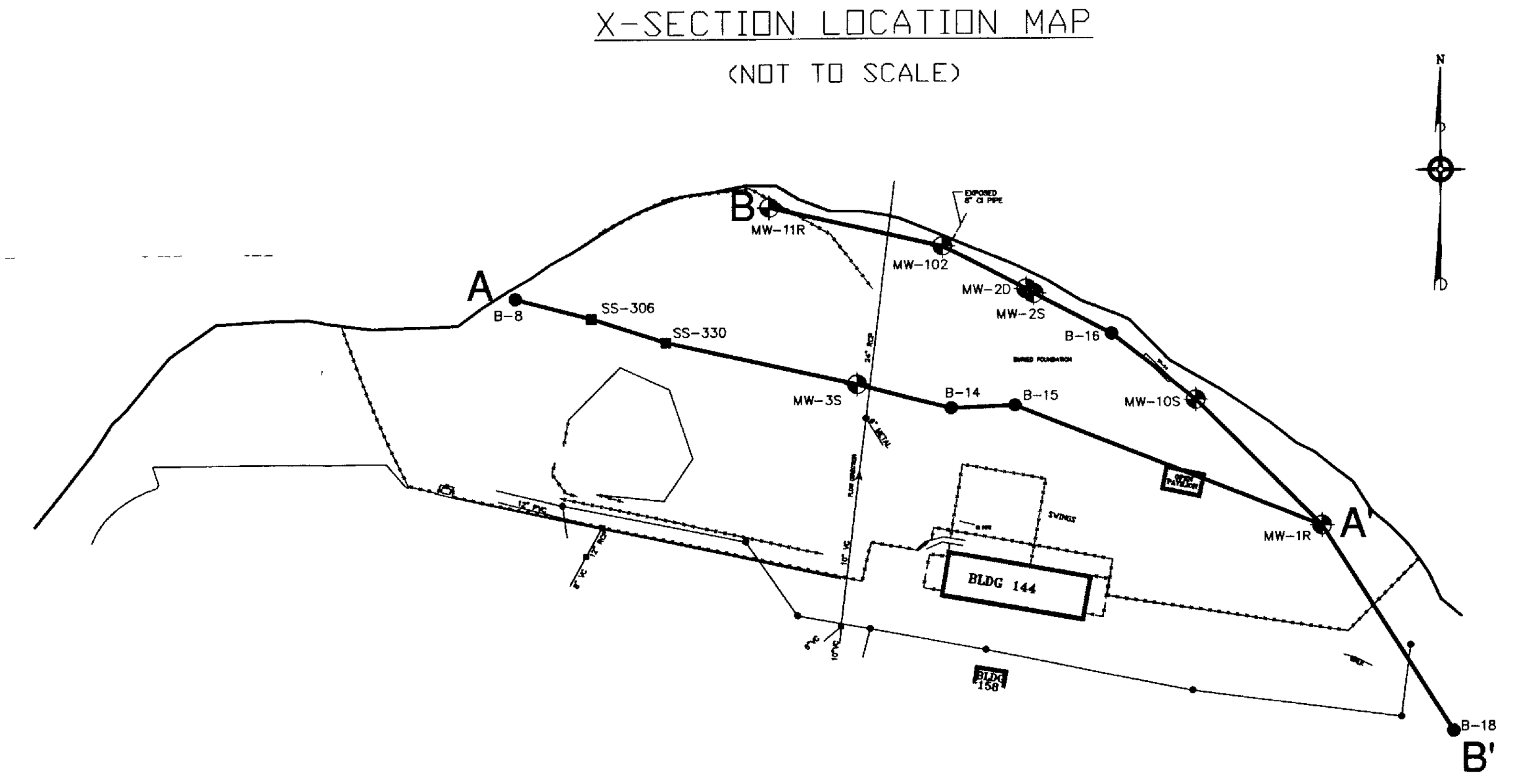
SOURCE: RIGIS WEB SITE – http://www.state.ri.us/dem/shellnar.htm

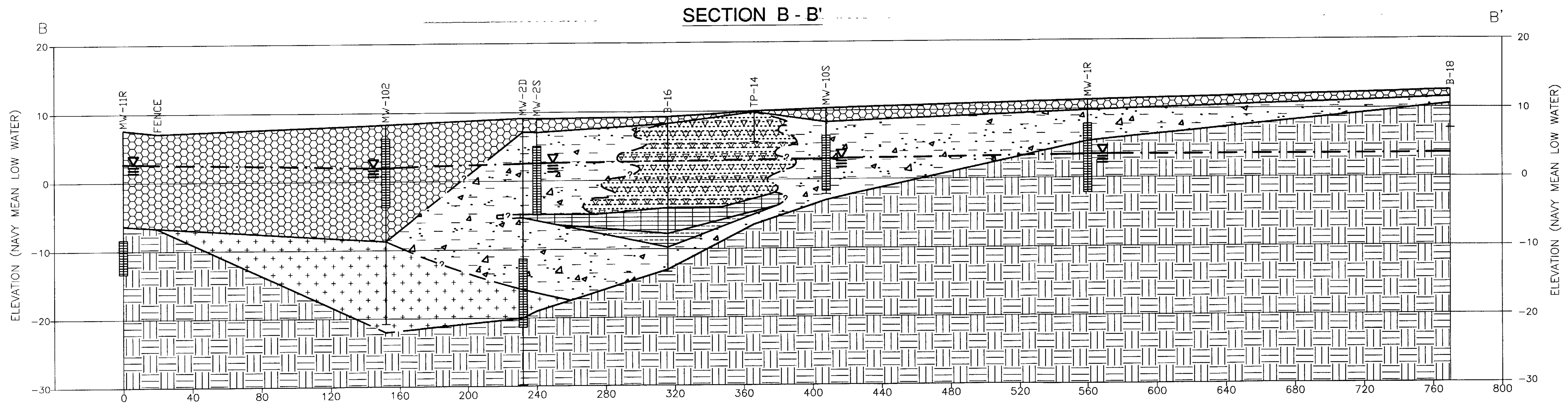
NARRAGANSETT BAY SHELLFISH CLOSURE AREAS (05/00 – 05/01)	FIGURE 3–1
OLD FIRE FIGHTING TRAINING AREA	TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND	

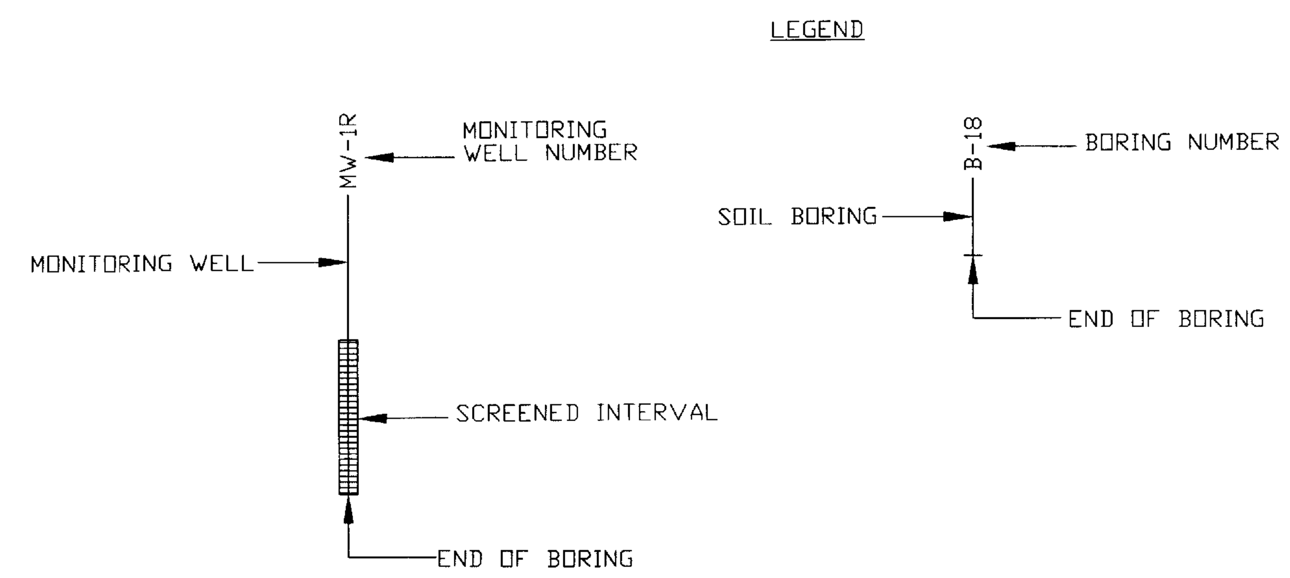
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	K. JALKUT	DATE:	SEPTEMBER 26, 2000
SCALE:	AS NOTED	ACAD NAME	DWG\5278\0531\FIG_3–1 DWG

55 Jonspin Road Wilmington, MA 01887
(978)658–7899









TP-# = TEST PIT LOCATION
SS-# = SURFACE SOIL LOCATION

WATER TABLE JULY 11, 1997

LEGEND

FILL – FINE TO MEDIUM SAND, SILT, GRAVEL, AND ROCK FRAGMENTS MIXED WITH VARYING AMOUNTS OF CONSTRUCTION–TYPE DEBRIS INCLUDING. ASPHALT, CONCRETE, METAL, BRICK, WOOD AND GLASS

SILTY SAND AND GRAVEL – FINE TO MEDIUM SAND, SILT AND GRAVEL, WITH VARYING AMOUNTS OF ROCK FRAGMENTS AND SEASHELL FRAGMENTS

SAND AND GRAVEL – MOSTLY FINE TO COARSE SAND AND GRAVEL, LESS SILT

PEAT – PEAT WITH VARYING AMOUNTS OF SAND AND SILT

SILT – MOSTLY SILT WITH LESS SAND AND GRAVEL

TILL – DENSE SILT WITH FINE TO MEDIUM SAND, GRAVEL AND ROCK FRAGMENTS

BEDROCK – CONGLOMERATE WITH QUARTZITE COBBLES

NOTES

1. THE DEPTHS AND THICKNESSES DETERMINED FOR THE SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN TEST BORINGS. THE STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, THE TRANSITION MAY BE GRADUAL. INFORMATION ON SUBSURFACE CONDITIONS EXIST ONLY AT THE LOCATION OF THE TEST BORINGS, THEREFORE, IT IS POSSIBLE THAT THE SUBSURFACE CONDITIONS MAY VARY FROM THOSE INDICATED.

2 WELL SCREEN WIDTHS ARE NOT TO SCALE.

3 HORIZONTAL DATUM IS BASED ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927 VERTICAL DATUM IS BASED ON NAVAL BASE MEAN LOW WATER (NGVD 1929 MINUS 1.6 FEET).

4 BASE PLAN BY GEURRIERE AND HALNON, INC , JULY 1997, DATED NOVEMBER 10, 1997, PROJ NO. 7578 CTO 288, BY BROWN AND ROOT ENVIRONMENTAL

5 GROUND ELEVATIONS WERE BASED ON BORING LOGS PROVIDED BY TRC

6. ELEVATIONS OF SUBSURFACE CONTACTS WERE GENERALIZED FROM BORING LOGS BY TRC AND TTNUS

7. PRESUMPTION MADE THAT APPROXIMATELY 1–2 FEET OF TOPSOIL (FILL) LIES BETWEEN THE MOUNDS AND ACROSS THE EASTERN PORTION OF THE SITE, UNLESS OTHERWISE SPECIFIED

8 BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORINGS. SEISMIC REFACTION SURVEY RESULTS WERE USED TO SUPPLEMENT THESE DATA IF A REFUSAL WAS NOTED IN A BORING THE TOP OF BEDROCK WAS ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED.

9 ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE

10 PLAN NOT TO BE USED FOR DESIGN.

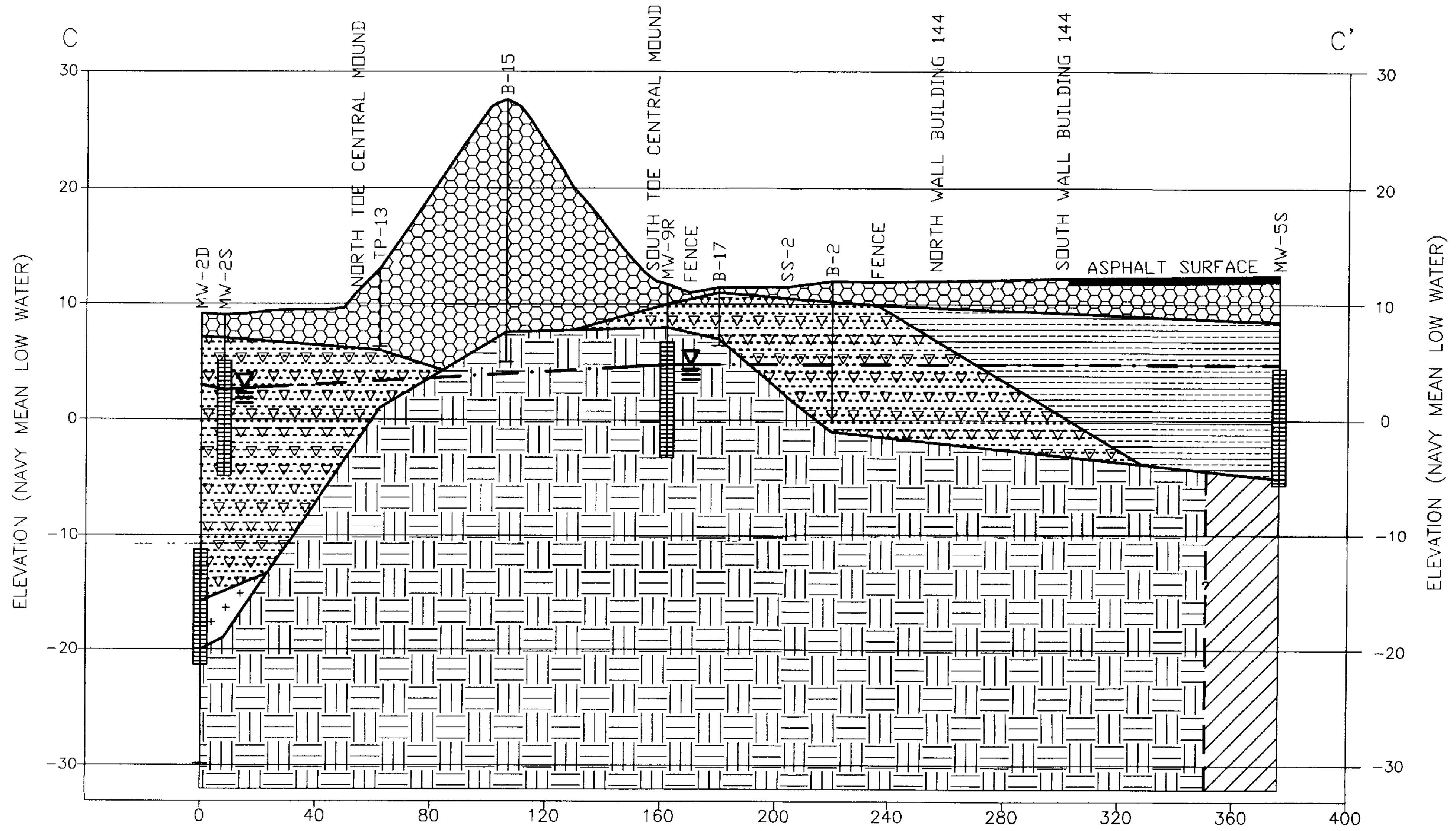
GRAPHIC SCALE

0' 10' 0' 40'

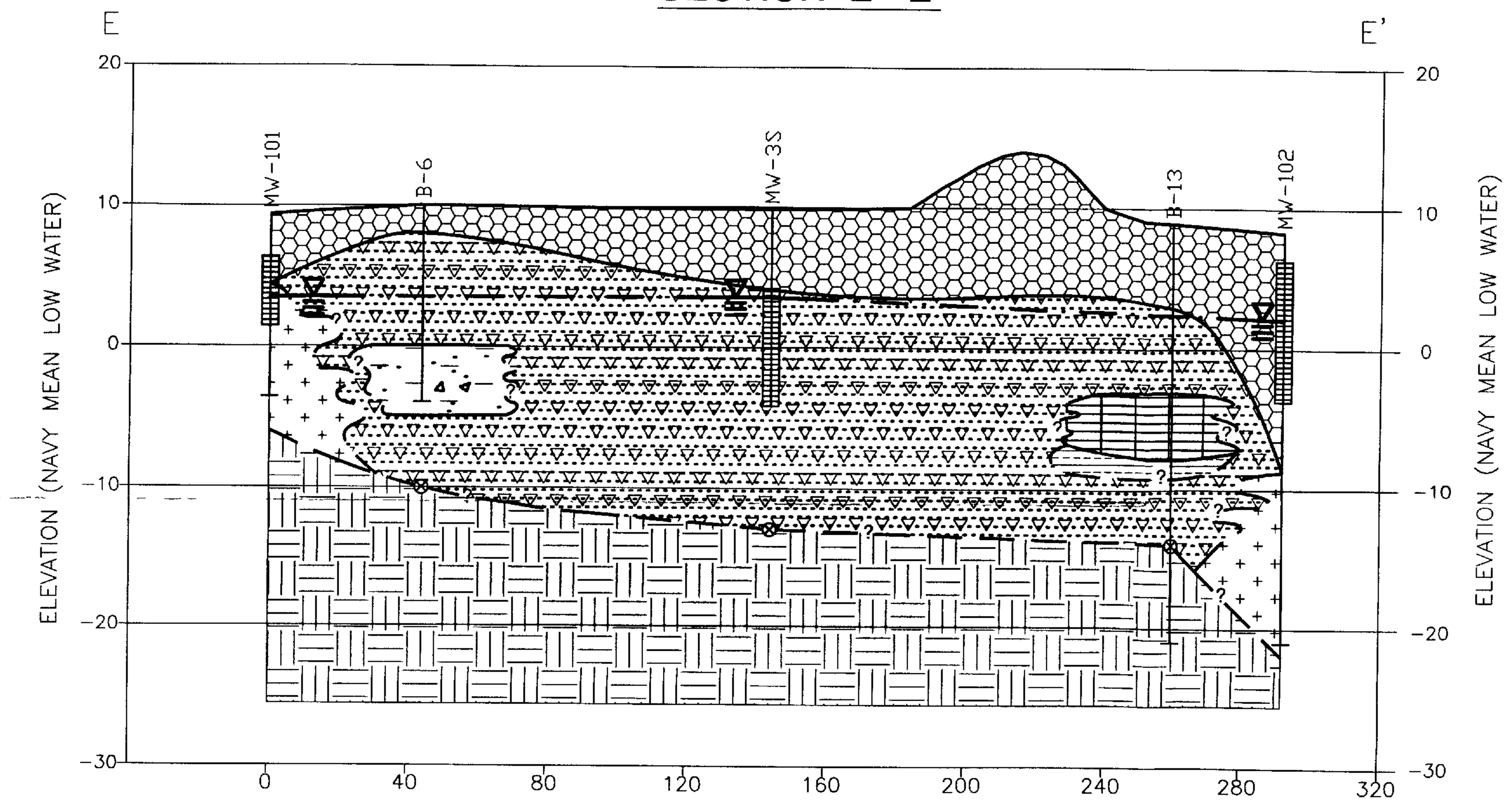
VERT· 1 INCH = 10 FEET HORIZ 1 INCH = 40 FEET
VERTICAL EXAGGERATION = 4X

DRAWN BY: D.W. MACDOUGALL	TITLE: GEOLOGICAL CROSS SECTIONS A–A' AND B–B' OLD FIRE FIGHTING TRAINING AREA NAVSTA NEWPORT – NEWPORT, RHODE ISLAND	TETRA TECH NUS, INC.
PREPARED BY. K. JALKUT	SOURCE: BASE PLAN BY SEE NOTES	55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658–7899
CHECKED BY· M HEALEY	SCALE. AS SHOWN / DATE OCTOBER 3, 2000 / PROJ. NO 5278	
PROJECT MANAGER: D. BAXTER	DRAWING NO. 3–2 / ACFILE NAME· DWG\5278\0531\FIG_3-2 DWG / REV· 0	
PROGRAM MANAGER. G. GARDNER		

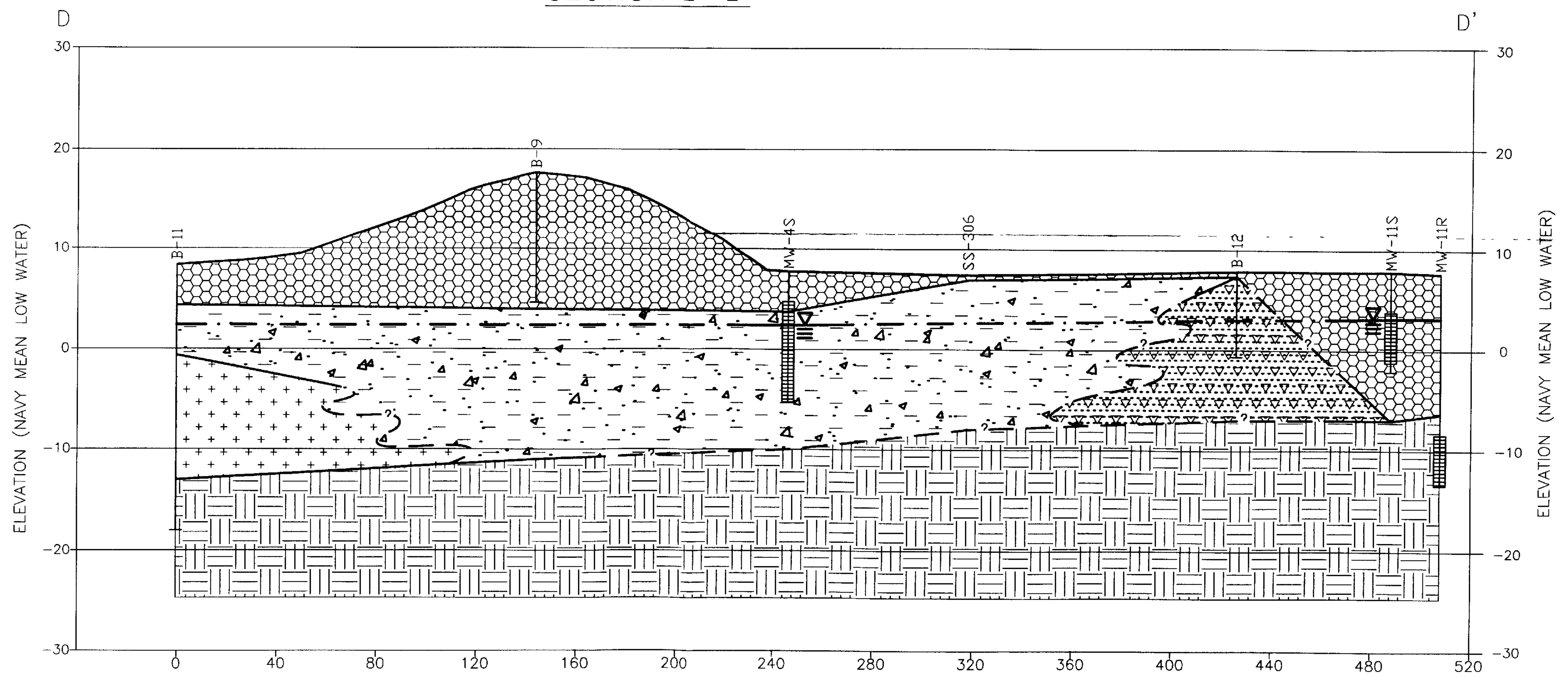
SECTION C - C'



SECTION E - E'

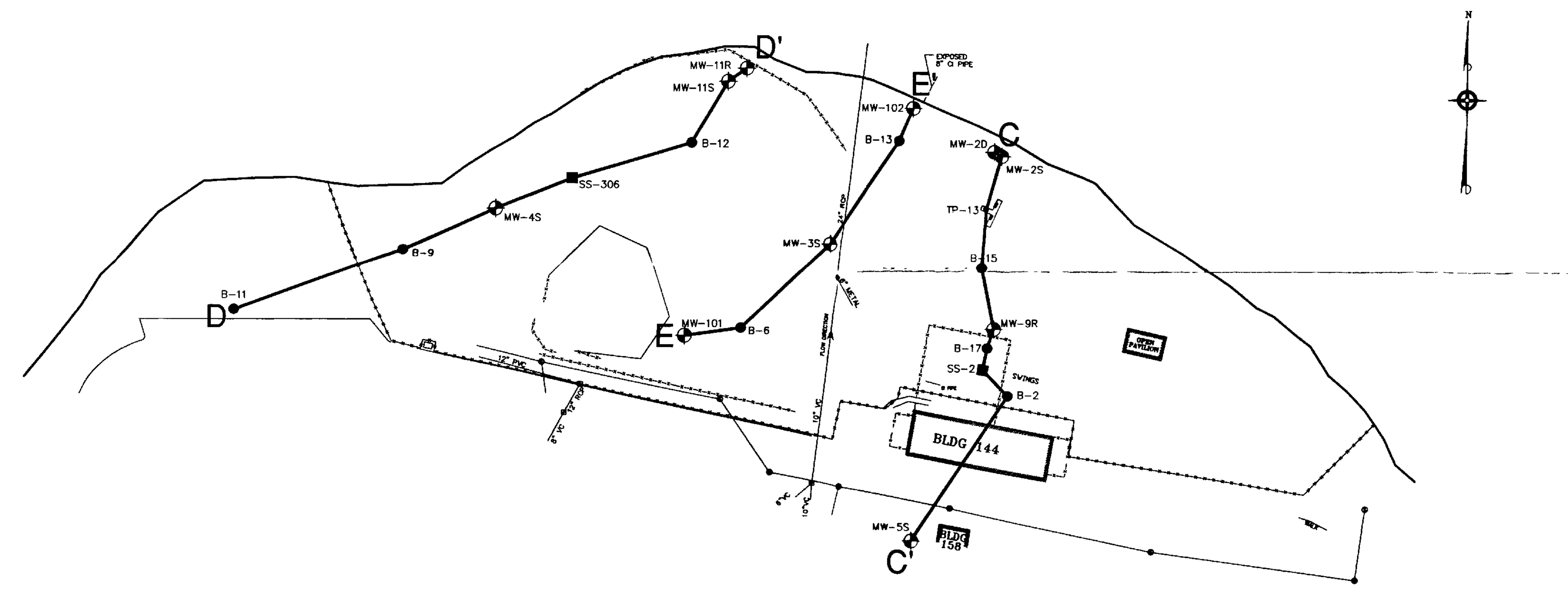


SECTION D - D'

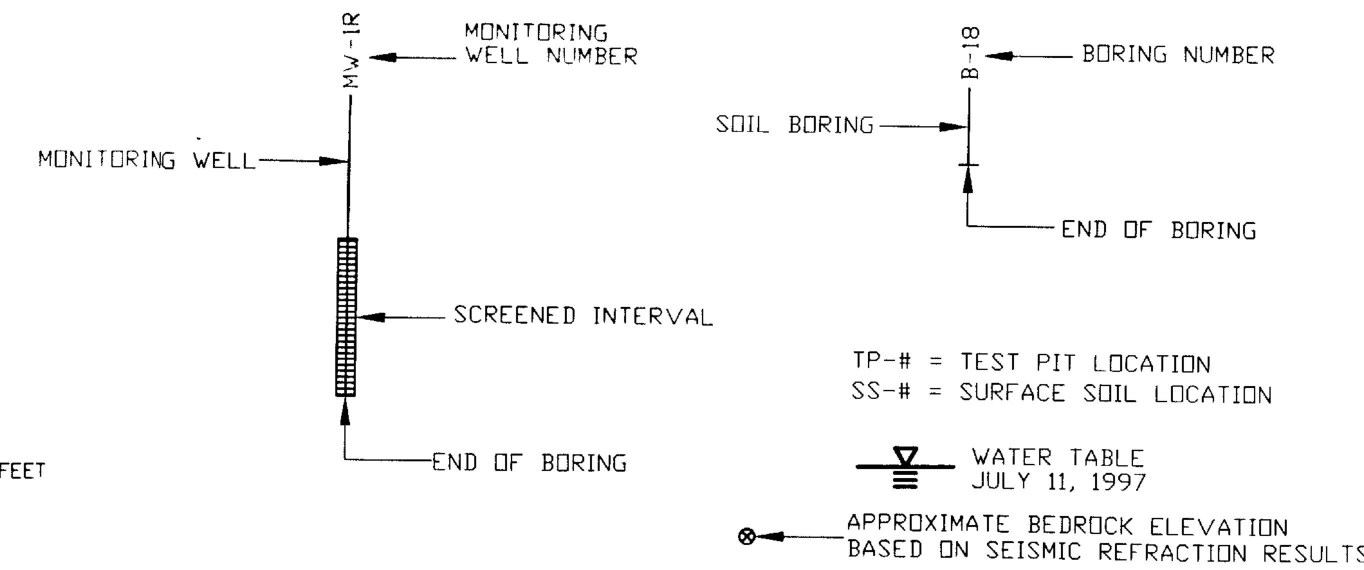


X-SECTION LOCATION MAP

(NOT TO SCALE)



LEGEND

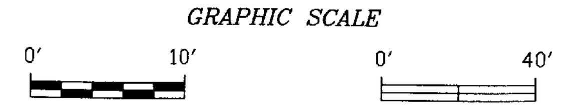


TP-# = TEST PIT LOCATION
SS-# = SURFACE SOIL LOCATION

WATER TABLE JULY 11, 1997

APPROXIMATE BEDROCK ELEVATION BASED ON SEISMIC REFRACTION RESULTS

GRAPHIC SCALE



VERT 1 INCH = 10 FEET HORIZ 1 INCH = 40 FEET

VERTICAL EXAGGERATION = 4X

LEGEND

FILL – FINE TO MEDIUM SAND, SILT, GRAVEL, AND ROCK FRAGMENTS MIXED WITH VARYING AMOUNTS OF CONSTRUCTION–TYPE DEBRIS INCLUDING ASPHALT, CONCRETE METAL, BRICK, WOOD AND GLASS

SILTY SAND AND GRAVEL – FINE TO MEDIUM SAND, SILT AND GRAVEL, WITH VARYING AMOUNTS OF ROCK FRAGMENTS AND SEASHELL FRAGMENTS

SAND AND GRAVEL – MOSTLY FINE TO COARSE SAND AND GRAVEL, LESS SILT

PEAT – PEAT WITH VARYING AMOUNTS OF SAND AND SILT

SILT – MOSTLY SILT WITH LESS SAND AND GRAVEL

TILL – DENSE SILT WITH FINE TO MEDIUM SAND, GRAVEL AND ROCK FRAGMENTS

BEDROCK – CONGLOMERATE WITH QUARTZITE COBBLES

BEDROCK – SHALE

NOTES

1 THE DEPTHS AND THICKNESSES DETERMINED FOR THE SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN TEST BORINGS THE STRATIFICATION LINES REPRESENT AN APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, THE TRANSITION MAY BE GRADUAL INFORMATION ON SUBSURFACE CONDITIONS EXIST ONLY AT THE LOCATION OF THE TEST BORINGS; THEREFORE, IT IS POSSIBLE THAT THE SUBSURFACE CONDITIONS MAY VARY FROM THOSE INDICATED

2 WELL SCREEN WIDTHS ARE NOT TO SCALE

3 HORIZONTAL DATUM IS BASED ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM IS BASED ON NAVAL BASE MEAN LOW WATER (NGVD 1929 MINUS 1 6 FEET)

4. BASE PLAN BY GEURRIERE AND HALNON, INC., JULY 1997, DATED NOVEMBER 10, 1997, PROJ. NO 7578 CTO 288, BY BROWN AND ROOT ENVIRONMENTAL

5 GROUND ELEVATIONS WERE BASED ON BORING LOGS PROVIDED BY TRC

6. ELEVATIONS OF SUBSURFACE CONTACTS WERE GENERALIZED FROM BORING LOGS BY TRC AND TTNUS

7 BASED ON THE SEISMIC REFRACTION SURVEY RESULTS, THE ESTIMATED ACCURACY OF DEPTH OF BEDROCK IS +/– 15 PERCENT OR 2 FEET, WHICHEVER IS GREATER THE DEPTHS DETERMINED FOR BEDROCK ⊗ ARE DEPTHS OF COMPETENT ROCK; DEEPLY WEATHERED ROCK MAY OCCUR AT SHALLOWER DEPTHS.

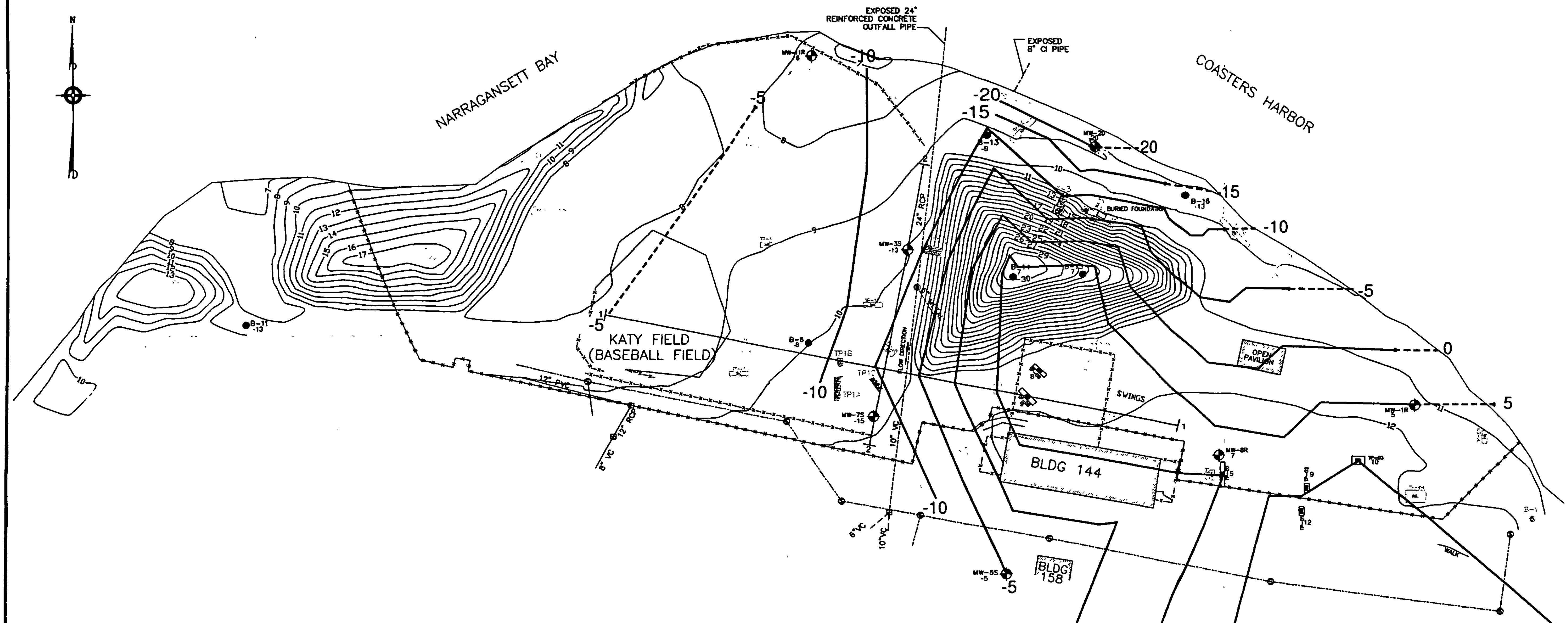
8 PRESUMPTION MADE THAT APPROXIMATELY 1–2 FEET OF TOPSOIL (FILL) LIES BETWEEN THE MOUNDS AND ACROSS THE EASTERN PORTION OF THE SITE, UNLESS OTHERWISE SPECIFIED

9 BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORINGS SEISMIC REFACTION SURVEY RESULTS WERE USED TO SUPPLEMENT THESE DATA IF A REFUSAL WAS NOTED IN A BORING THE TOP OF BEDROCK WAS ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED

10 ALL LOCATIONS TO BE CONSIDERED APPROXIMATE

11 PLAN NOT TO BE USED FOR DESIGN

DRAWN BY: D W MACDOUGALL	TITLE: GEOLOGICAL CROSS SECTIONS C–C', D–D' AND E–E' OLD FIRE FIGHTING TRAINING AREA NAVSTA NEWPORT – NEWPORT, RHODE ISLAND	TETRA TECH NUS, INC.
PREPARED BY: K JALKUT	SOURCE: BASE PLAN BY SEE NOTES	
CHECKED BY: M HEALEY	SCALE: AS SHOWN; DATE: OCTOBER 3, 2000; PROJ NO: 5278	55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658–7899
PROJECT MANAGER D BAXTER	DRAWING NO: 3–3; ACFILE NAME: DWG\5278\0531\FIG_3-3.DWG; REV: 0	
PROGRAM MANAGER: G GARDNER		



NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED 'BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED 'KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

3. BEDROCK ELEVATIONS ARE BASED ON THE DEPTH TO BEDROCK OBSERVED IN TEST PITS AND BORINGS. SEISMIC REFRACTION SURVEY RESULTS WERE USED TO SUPPLEMENT THESE DATA. IF A REFUSAL WAS NOTED IN A BORING THE TOP OF BEDROCK WAS ASSUMED TO BE WITHIN ONE FOOT OF THE REFUSAL DEPTH. THE BEDROCK CONTOURS ARE INTERPRETATIONS OF THESE DATA AND THE ACTUAL BEDROCK ELEVATION MAY BE DIFFERENT FROM THE ELEVATION INDICATED.

4. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

5. PLAN NOT TO BE USED FOR DESIGN.

LEGEND

——— 0	BEDROCK ELEVATION CONTOUR WITH ELEVATION
- - - - →	BEDROCK ELEVATION CONTOUR (ESTIMATED)
1├──┤1	SEISMIC LINE AND NUMBER
MW-11R -6	MONITORING WELL WITH BEDROCK ELEVATION
B-11 -13	SOIL BORING WITH BEDROCK ELEVATION
TP-03 10	TEST PIT WITH BEDROCK ELEVATION
	SANITARY SEWER MANHOLE
	SANITARY SEWER
	STORM SEWER MANHOLE
	STORM SEWER
	CATCH BASIN

GRAPHIC SCALE

0' 80' 160'

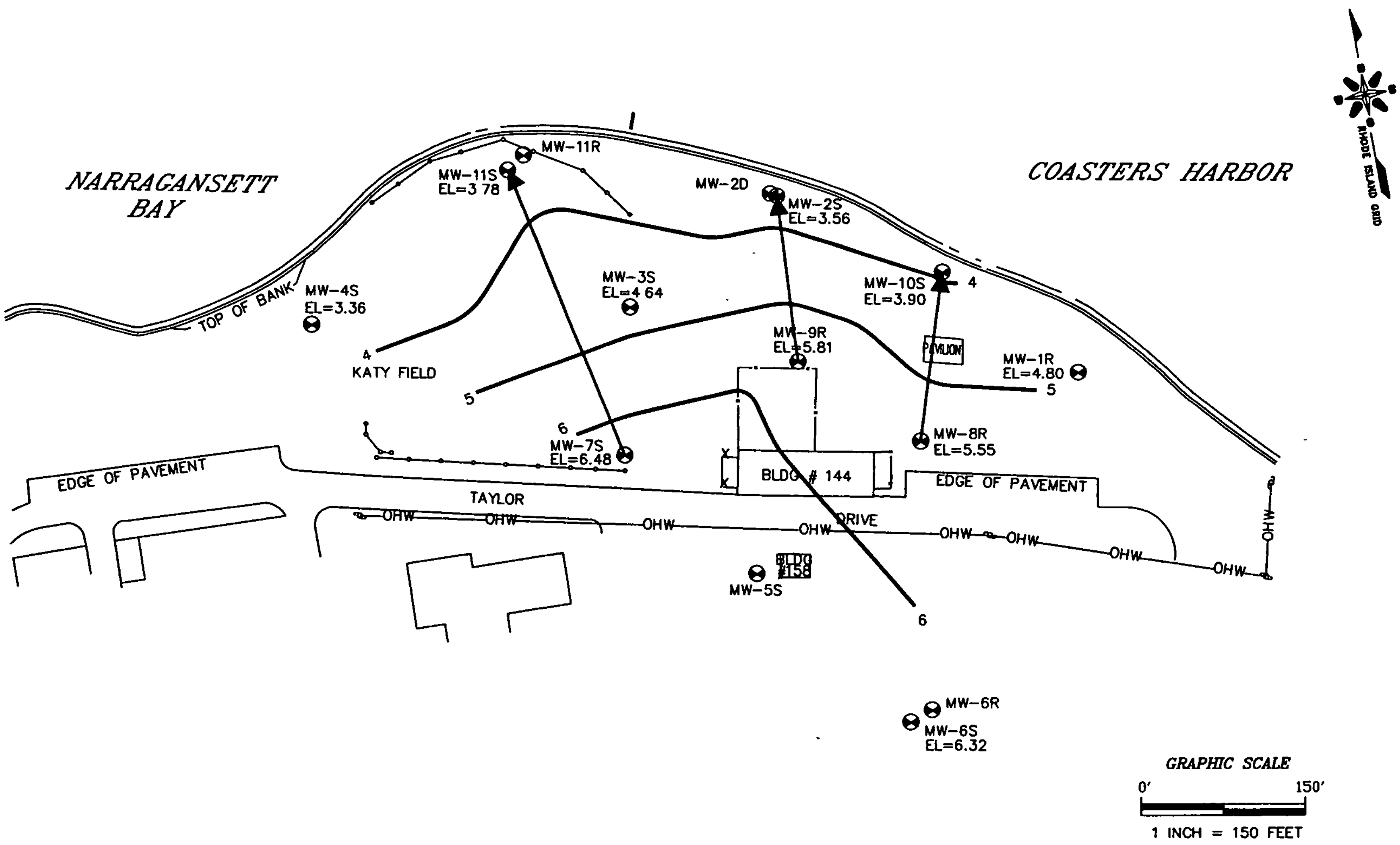
1 INCH = 80 FEET

BEDROCK SURFACE ELEVATION CONTOUR MAP			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	M. HEALEY	DATE:	OCTOBER 8, 2000
SCALE:	1" = 80'	FILE NO.:	DWG\5278\0531\FIG_3-4A.DWG

FIGURE 3–4

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



LEGEND

- MW-3............MONITORING WELL
- ....FENCE LINE
- —OHW— ....OVERHEAD WIRES
- ....UTILITY POLE
- ....CHAIN LINK FENCE
- 5 ....WATER LEVEL ELEVATION (MLW)
- GROUNDWATER FLOW DIRECTION

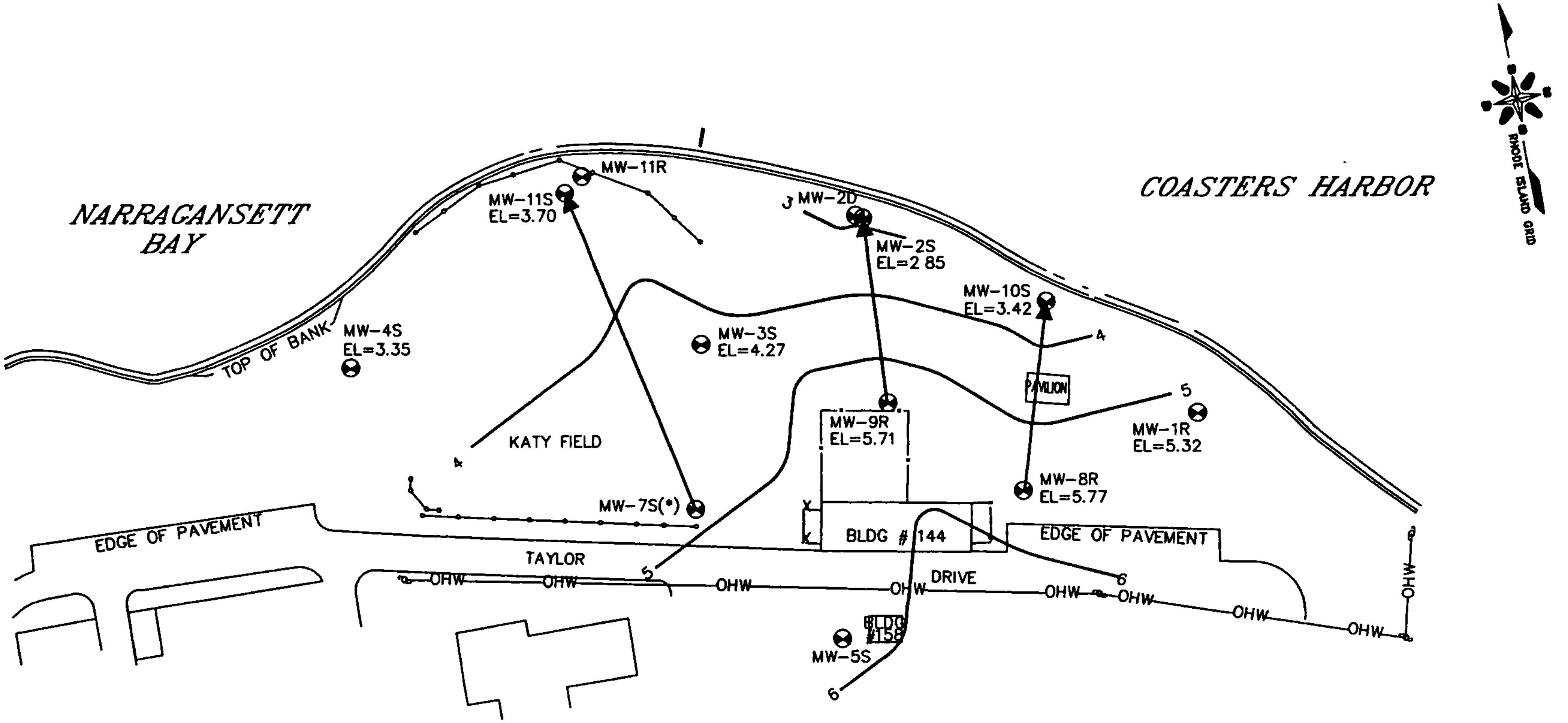
SOURCE: OFFTA DRAFT RI, TRC 1994

WATER TABLE CONTOURS (01/04/94)			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	JANUARY 4, 2001
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0533\FIG_3-5.DWG

FIGURE 3-5

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899



(*)-NOTE: WELL COVER WAS FROZEN AND WATER LEVEL COULD NOT BE OBTAINED AT WELL MW-7S.

SOURCE: OFFTA DRAFT RI, TRC 1994

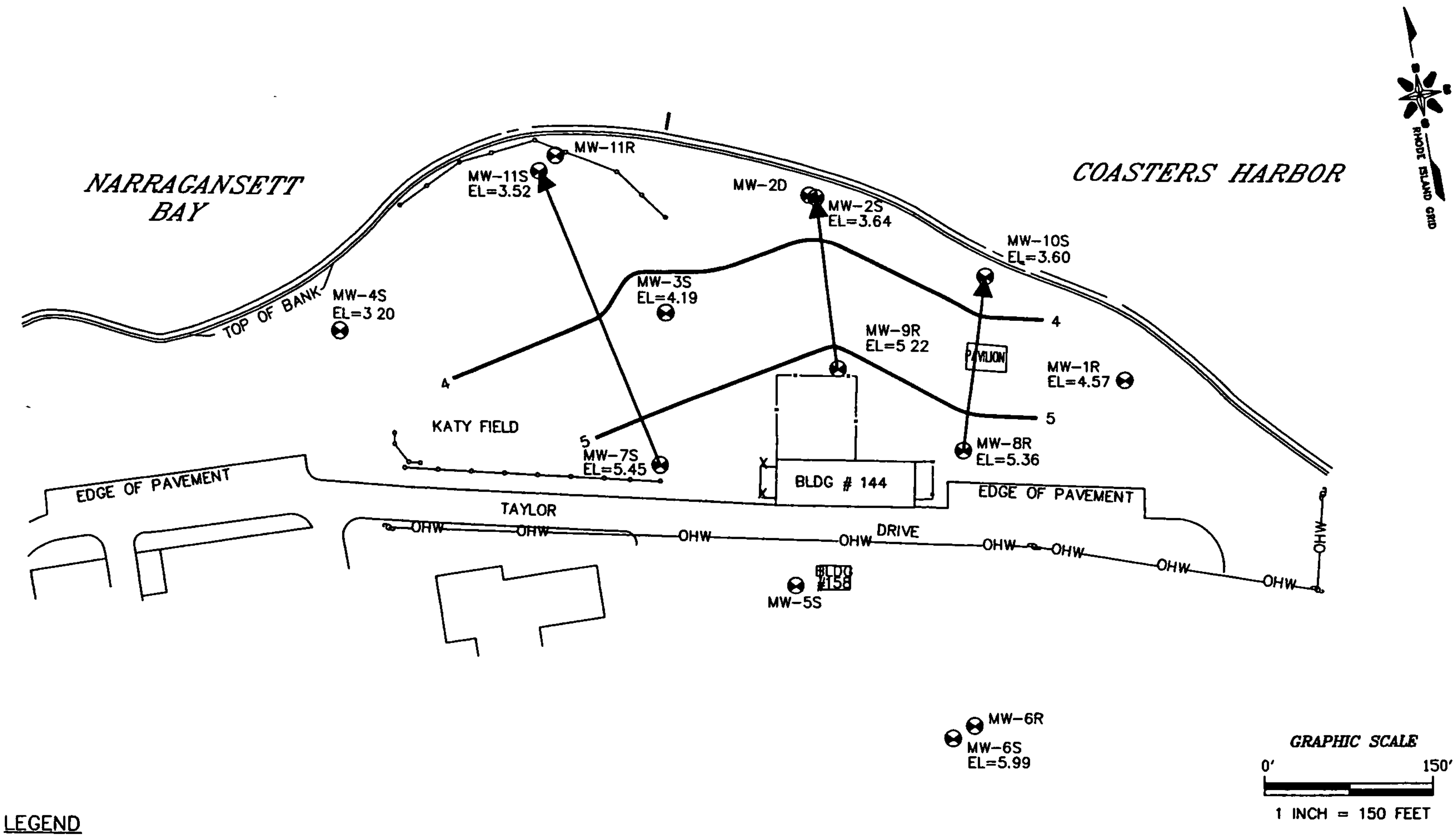
LEGEND

- MW-3 ....MONITORING WELL
- ....FENCE LINE
- OHW ....OVERHEAD WIRES
- ....UTILITY POLE
- ....CHAIN LINK FENCE
- 5 ....WATER LEVEL ELEVATION (MLW)
- GROUNDWATER FLOW DIRECTION

WATER TABLE CONTOURS (02/22/94)			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT - NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	JANUARY 4, 2001
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0533\FIG_3-6.DWG

FIGURE 3-6

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899

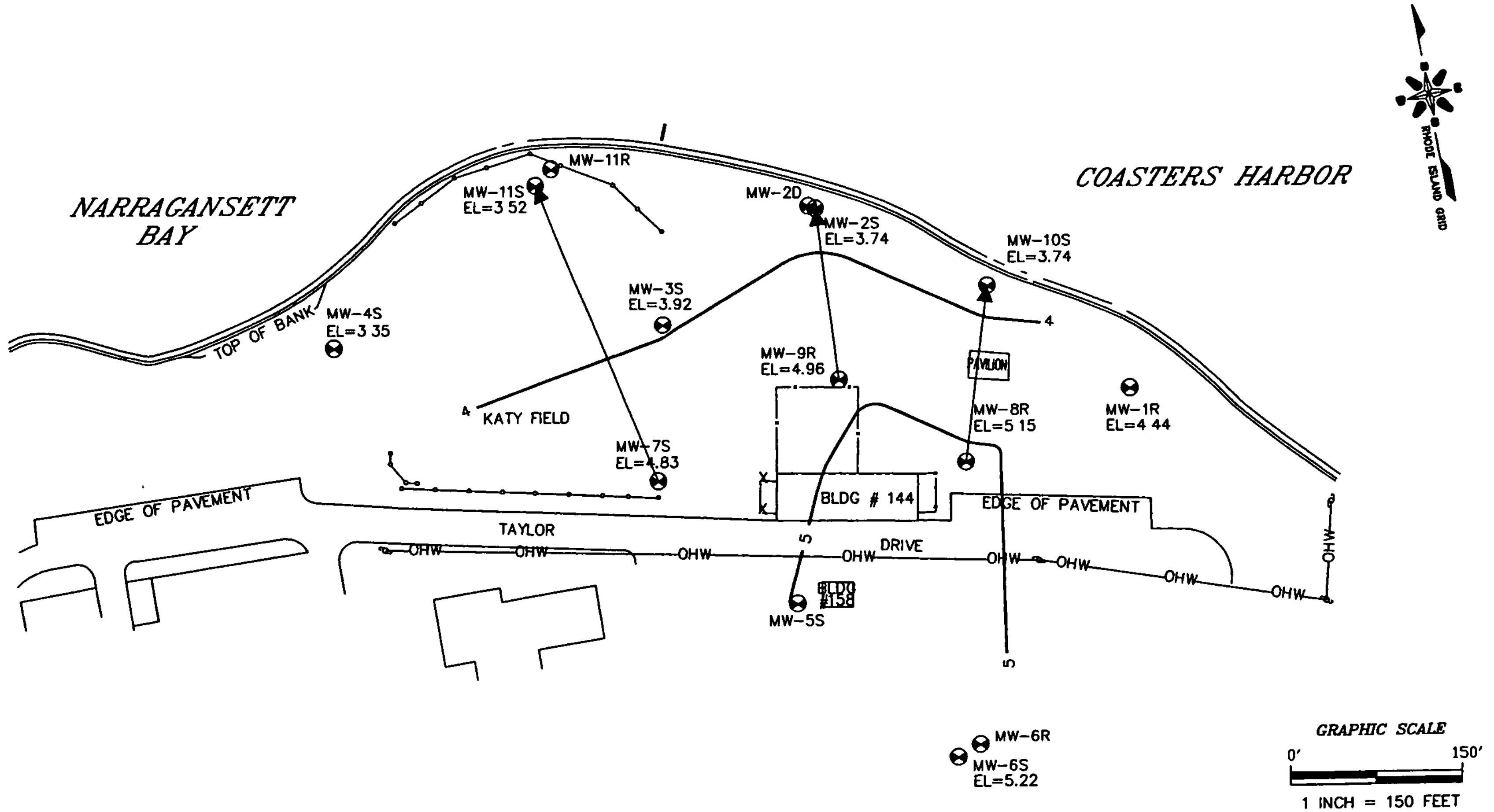


LEGEND

- MW-3 ....MONITORING WELL
- ....FENCE LINE
- OHW ....OVERHEAD WIRES
- ....UTILITY POLE
- ....CHAIN LINK FENCE
- 5 ....WATER LEVEL ELEVATION (MLW)
- GROUNDWATER FLOW DIRECTION

SOURCE: OFFTA DRAFT RI, TRC 1994

WATER TABLE CONTOURS (05/12/94)				FIGURE 3-7
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	
CHECKED BY:	D. BAXTER	DATE:	JANUARY 4, 2001	
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0533\FIG_3-7.DWG	

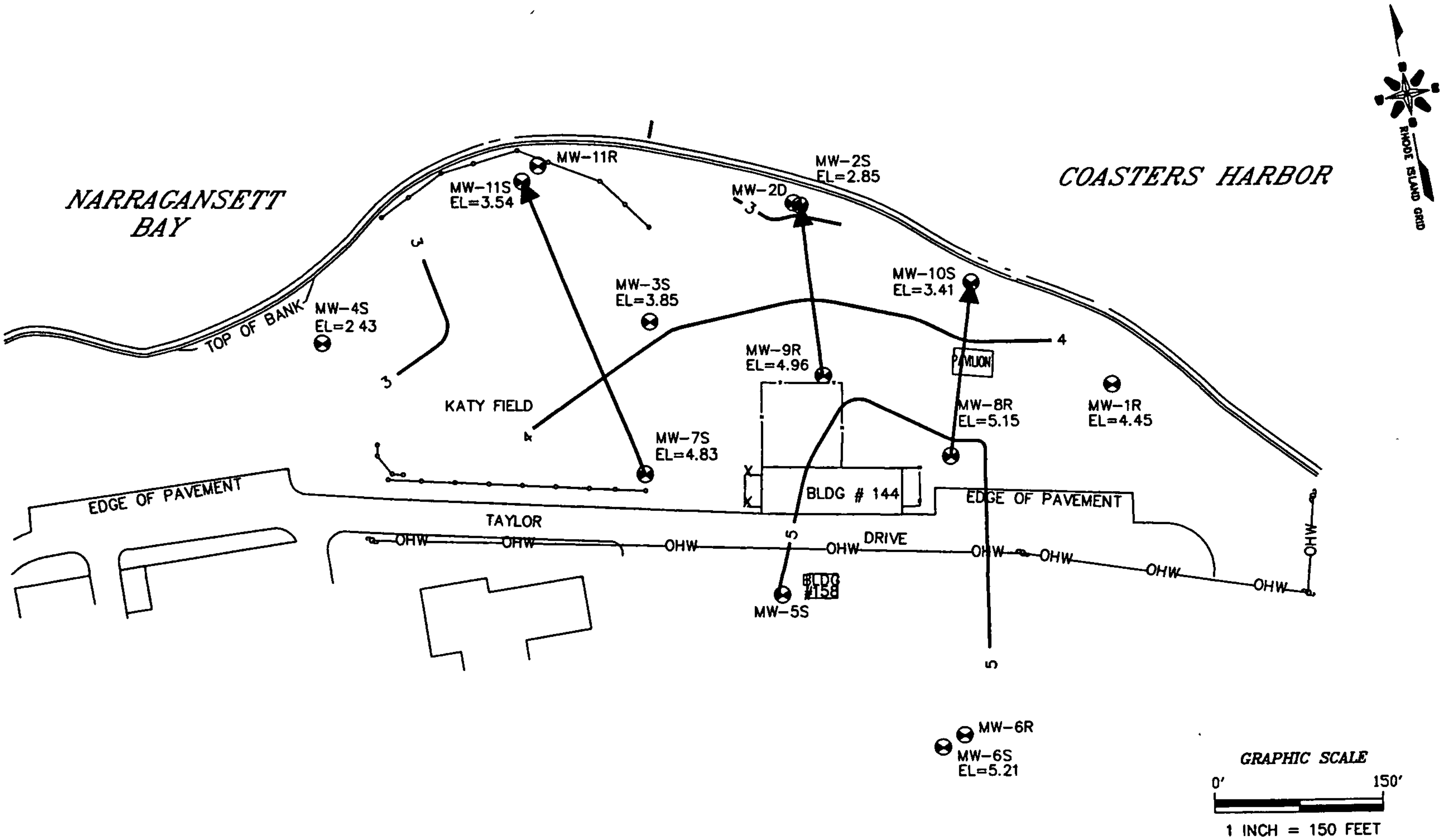


LEGEND

MW-3............MONITORING WELL
.............FENCE LINE
-OHW- ....OVERHEAD WIRES
.............UTILITY POLE
.............CHAIN LINK FENCE
5 ....WATER LEVEL ELEVATION (MLW)
GROUNDWATER FLOW DIRECTION

SOURCE: OFFTA DRAFT RI, TRC 1994

WATER TABLE CONTOURS (07/12/94 – HIGH TIDE)		FIGURE 3-8
OLD FIRE FIGHTING TRAINING AREA		TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND		55 Jonspin Road Wilmington, MA 01887 (978)658-7899
DRAWN BY: D.W MACDOUGALL	REV.: 0	
CHECKED BY: D. BAXTER	DATE: JANUARY 4, 2001	
SCALE: 1" = 150'	FILE NO.: DWG\5278\0533\FIG_3-8.DWG	



SOURCE: OFFTA DRAFT RI, TRC 1994

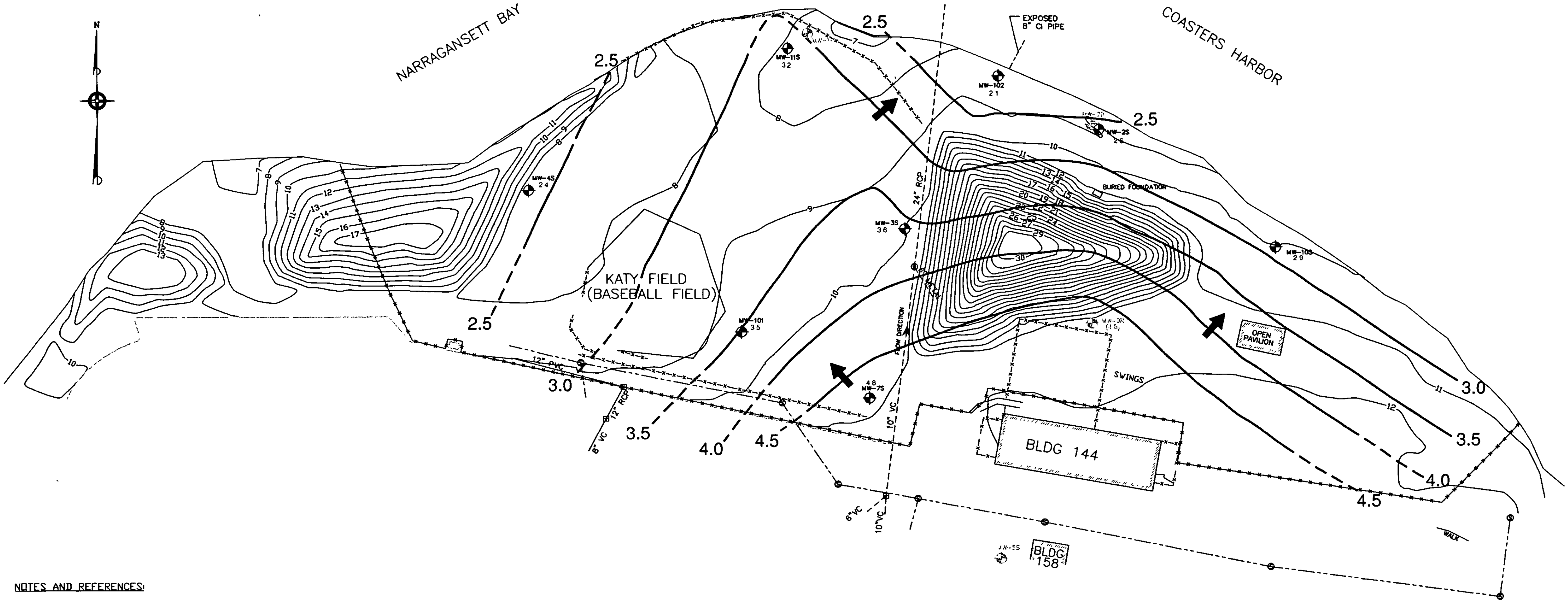
LEGEND

- MW-3 ....MONITORING WELL
- ....FENCE LINE
- –OHW– ....OVERHEAD WIRES
- ....UTILITY POLE
- ....CHAIN LINK FENCE
- 5 ....WATER LEVEL ELEVATION (MLW)
- GROUNDWATER FLOW DIRECTION

WATER TABLE CONTOURS (07/12/94 – LOW TIDE)			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	D. BAXTER	DATE:	MAY 23, 2001
SCALE:	1" = 150'	FILE NO.:	DWG\5278\0533\FIG_3-9.DWG

FIGURE 3-9

TETRA TECH NUS, INC.
55 Jonspin Road Wilmington, MA 01887
(978)658-7899



NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED 'BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED 'KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVAL BASE MEAN LOW WATER.

3. GROUNDWATER FLOW IN OVERBURDEN WELLS DURING A RISING TIDE ON 7/11/97.

4. MW-101 INSTALLED ON 7/9/97. MW-102 INSTALLED ON 7/8/97.

5. OMITTED WATER LEVEL DATA FOR MW-5S FROM PLOT. IT IS INCONSISTENT WITH HISTORICAL DATA. MEASUREMENT MAY HAVE BEEN ERRONEOUS.

6. LOW TIDE AT 6:00 A.M. ON 7/11/97. WATER LEVELS COLLECTED BETWEEN 0720 AND 0846.

7. MW-10S AND MW-5S CONSIDERED OVERBURDEN WELLS, HOWEVER, SCREENED INTERVALS IN EACH CROSSES THE OVERBURDEN/BEDROCK INTERFACE. THE MAJORITY OF THE SCREEN IS IN THE OVERBURDEN.

8. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

9. PLAN NOT TO BE USED FOR DESIGN.

LEGEND

4 OVERBURDEN GROUNDWATER CONTOUR WITH ELEVATION

OVERBURDEN GROUNDWATER CONTOUR (ESTIMATED)

MW-101 35 MONITORING WELL WITH GROUNDWATER ELEVATION

GROUNDWATER FLOW DIRECTION

SANITARY SEWER MANHOLE

SANITARY SEWER

STORM SEWER MANHOLE

STORM SEWER MANHOLE

CATCH BASIN

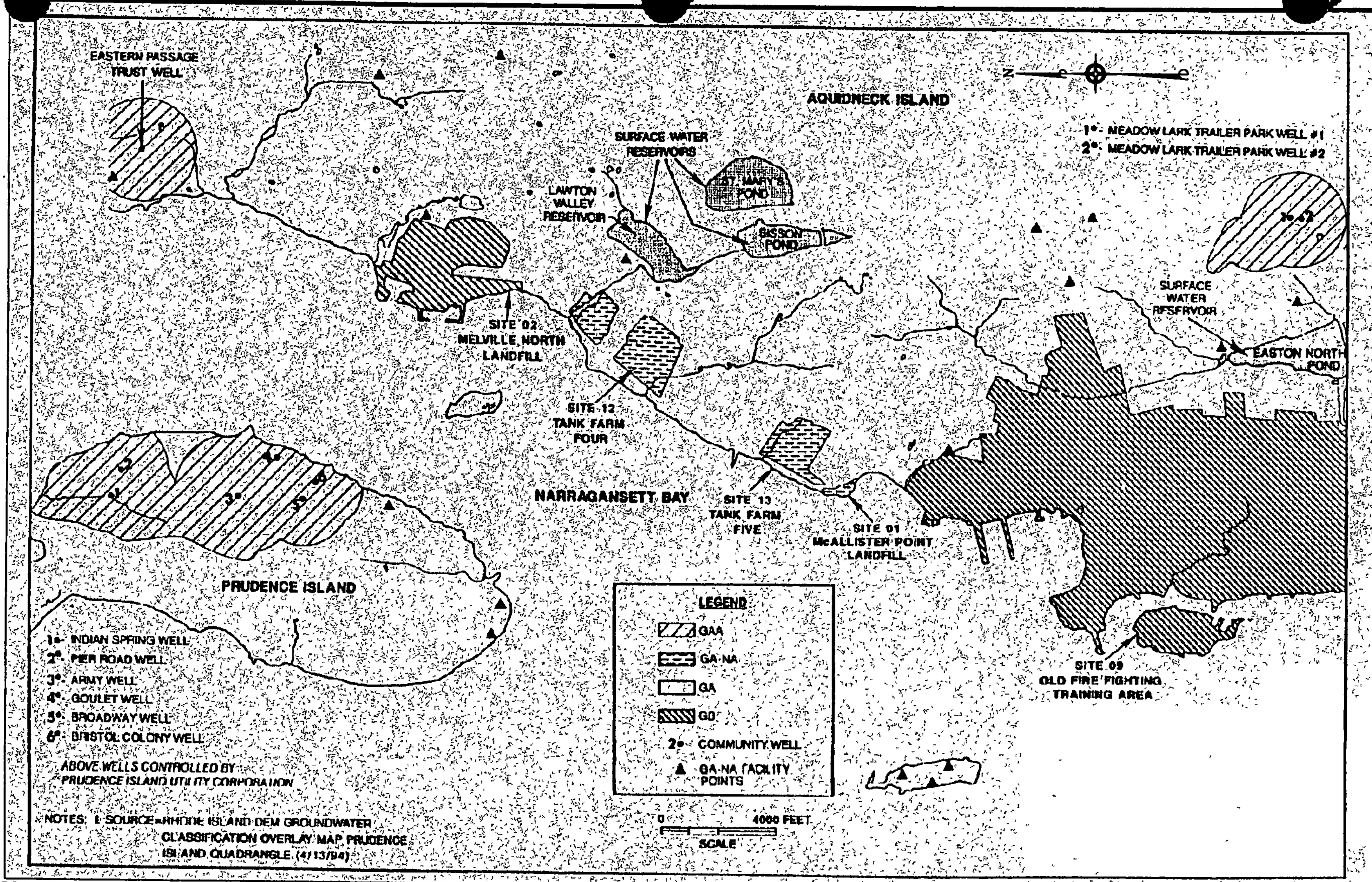
MW-6S 49

GRAPHIC SCALE

0' 80' 160'

1 INCH = 80 FEET

WATER TABLE CONTOURS (07/11/97)				FIGURE 3-10
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				
DRAWN BY:	D.W. MACDOUGALL	REV.:	0	55 Jonspin Road Wilmington, MA 01887
CHECKED BY:	T. DORGAN	DATE:	JANUARY 4, 2001	(978)658-7899
SCALE:	1" = 80'	FILE NO	DWG\5278\0533\FIG_3-10 DWG	



SOURCE: TRC ENVIRONMENTAL CORP., DRAFT FINAL OFFTA RI REPORT, 1994.

GROUNDWATER CLASSIFICATION AND WATER USE MAP			
OLD FIRE FIGHTING TRAINING AREA			
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND			
DRAWN BY	D.W. MACDOUGALL	REV:	0
CHECKED BY	J. FORRELLI	DATE:	OCTOBER 3, 2000
SCALE:	AS NOTED	FILE NO.:	DWG\5278\0531\FIG_3-11 DWG

FIGURE 3-11

TETRA TECH NUS, INC.

55 Jonspin Road Wilmington, MA 01887
(978)658-7899

NOTES AND REFERENCES

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO 990205-01

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927 VERTICAL DATUM BASED ON NAVEL BASE MEAN LOW WATER

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE

4. PLAN NOT TO BE USED FOR DESIGN

LEGEND

- CATCH BASIN
- FENCE
- EXISTING CONTOUR
- SS-28 SURFACE SOIL SAMPLE LOCATIONS
- B-16 SOIL BORING LOCATION WHERE SURFACE SOIL SAMPLE WAS COLLECTED
- MW-6S MONITORING WELL LOCATION WHERE SURFACE SOIL SAMPLE WAS COLLECTED
- SSD-333 SHORELINE SEDIMENT SAMPLE LOCATIONS
- STORM SEWER

GRAPHIC SCALE

40' 0' 40' 80'

1 INCH = 40 FEET

DRAWN BY: D.W. MACDOUGALL	TITLE: SURFACE SOIL AND SHORELINE SEDIMENT SAMPLE LOCATIONS OLD FIRE FIGHTING TRAINING AREA NAVAL STATION – NEWPORT, RHODE ISLAND		
PREPARED BY: D. BAXTER			
CHECKED BY: J. FORRELLI			
	SOURCE: BASE PLAN BY SEE NOTES		
PROJECT MANAGER: D. BAXTER	SCALE: 1" = 40'	DATE: OCTOBER 2, 2000	PROJ. NO. 5278
PROGRAM MANAGER: G. GARDNER	DRAWING NO. 4-1	ACFILE NAME: DWG\5278\0531\FIG_4-1.DWG	REV: 0

TETRA TECH NUS, INC.
55 JONSPIN ROAD
WILMINGTON, MASSACHUSETTS 01887
(978)658-7899

00144706-24

LEGEND

- CATCH BASIN
- —x—x—x—x FENCE
- XX EXISTING CONTOUR
- B-16 SOIL BORING LOCATION WHERE SUBSURFACE SOIL SAMPLE(S) WERE COLLECTED
- MW-2S MONITORING WELL BORING LOCATION WHERE SUBSURFACE SOIL SAMPLE(S) WERE COLLECTED
- TP-10 TEST PIT LOCATION WHERE SUBSURFACE SOIL SAMPLE(S) WERE COLLECTED (B&RE, 6/97)
- TP1C TEST PIT LOCATION WHERE SUBSURFACE SOIL SAMPLE(S) WERE COLLECTED (TRC, 1/94)
- — — STORM SEWER

NOTES AND REFERENCES

1 DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ NO. 7578 CTO 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE. BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO 990205-01.

2 HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927 VERTICAL DATUM BASED ON NAVEL BASE MEAN LOW WATER.

3 ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

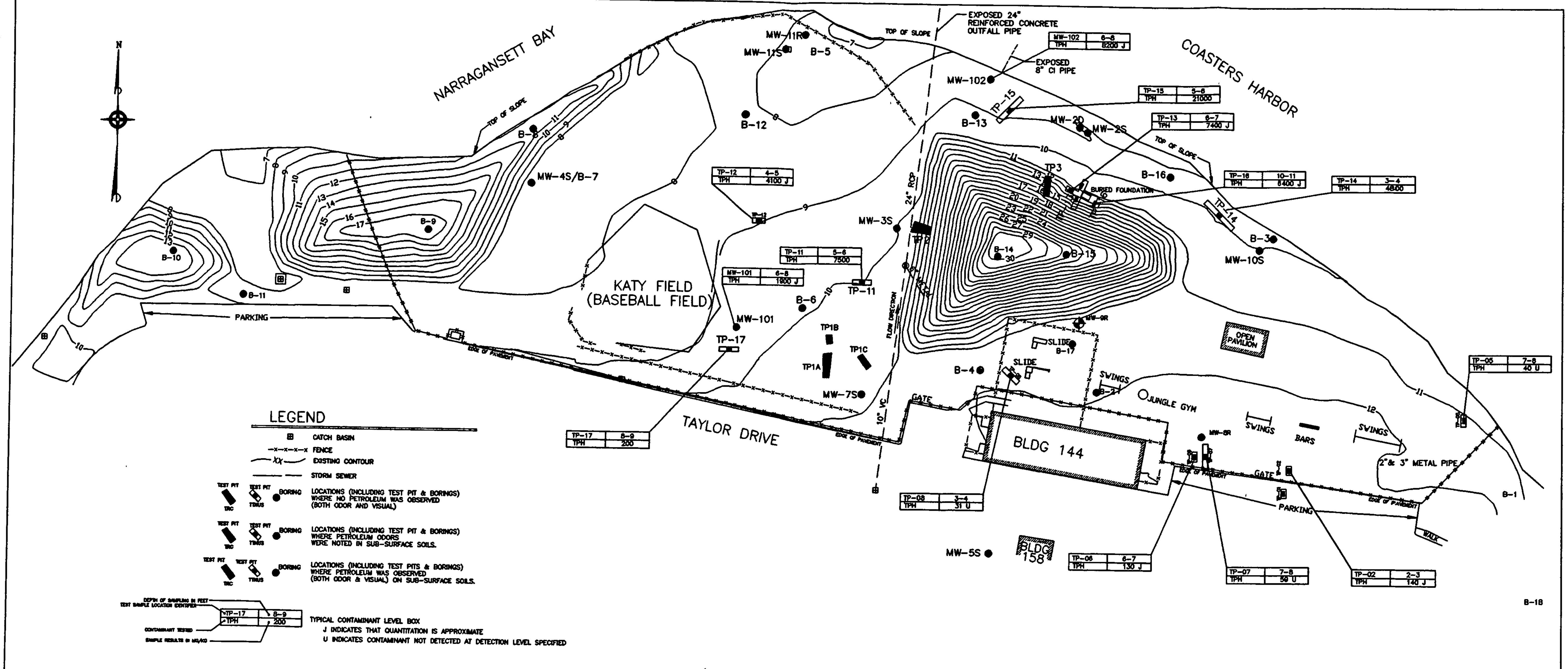
4 PLAN NOT TO BE USED FOR DESIGN

GRAPHIC SCALE

40' 0' 40' 80'

1 INCH = 40 FEET

DRAWN BY: DWM / RGD	TITLE: SUBSURFACE SOIL SAMPLE LOCATIONS OLD FIRE FIGHTING TRAINING AREA NAVAL STATION – NEWPORT, RHODE ISLAND	TETRA TECH NUS, INC. 55 JONSPIN ROAD WILMINGTON, MASSACHUSETTS 01887 (978)658-7899
PREPARED BY: D. BAXTER	SOURCE: BASE PLAN BY SEE NOTES.	
CHECKED BY: J FORRELLI	SCALE: 1" = 40' · DATE: OCTOBER 6, 2000 · PROJ. NO 5278	
PROJECT MANAGER D BAXTER	DRAWING NO 4-2 · ACFILE NAME DWG\5278\0531\FIG_4-2.DWG · REV. 0	
PROGRAM MANAGER: G. GARDNER		



NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED 'BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED 'KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVEL BASE MEAN LOW WATER.

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

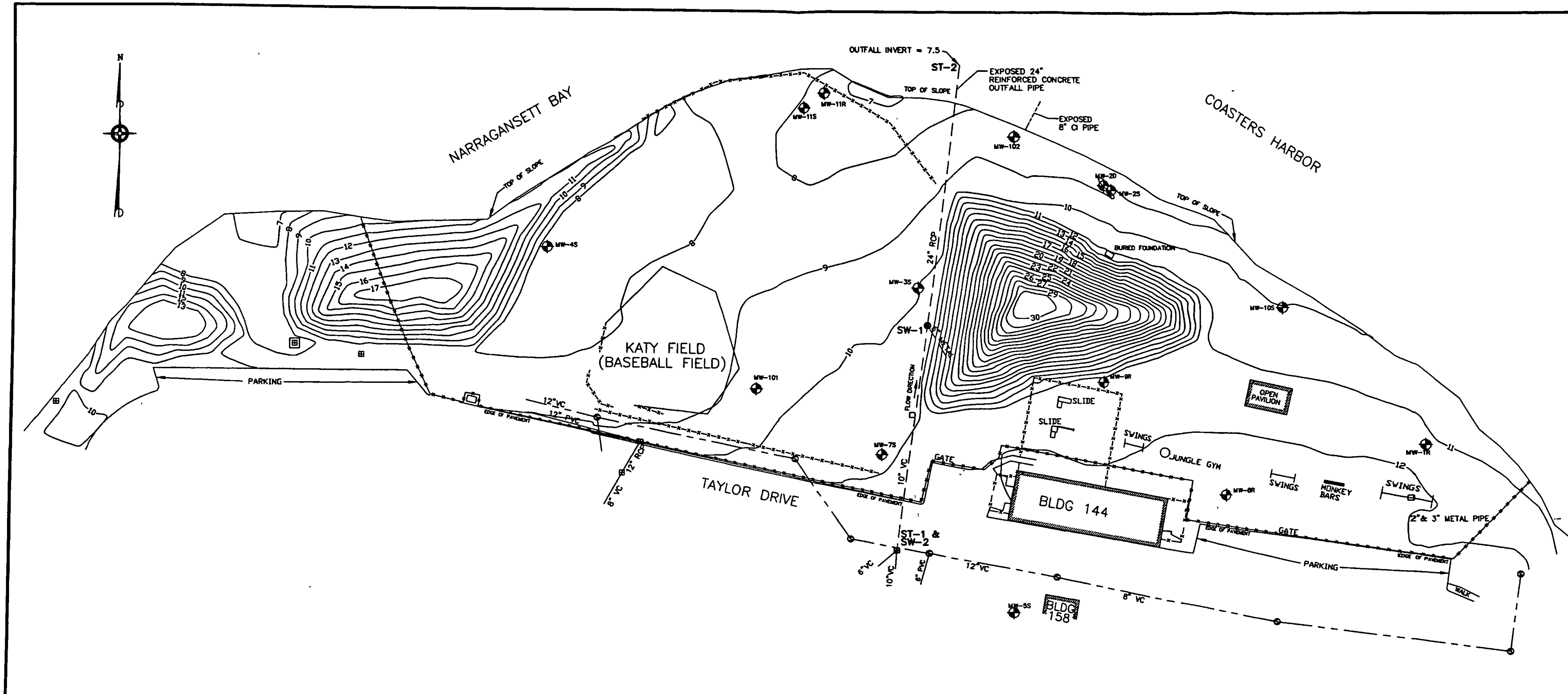
4. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

0' 80' 160'

1 INCH = 80 FEET

PETROLEUM SOIL CONTAMINATION				FIGURE 4-3
OLD FIRE FIGHTING TRAINING AREA				TETRA TECH NUS, INC.
NAVSTA NEWPORT – NEWPORT, RHODE ISLAND				
DRAWN BY:	DWM / RGD	REV.:	0	55 Jonspin Road Wilmington, MA 01887
CHECKED BY:	J. FORRELLI	DATE:	APRIL 02, 2001	(978)658-7899
SCALE:	1" = 80'	FILE NO.: DWG\5278\0531\FIG_4-3.DWG		



NOTES AND REFERENCES:

1. DRAWING COMPILED FROM A DRAWING ENTITLED "BASE MAP OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND, JULY 1997, PROJ. NO. 7578 CTO: 288, BY BROWN & ROOT ENVIRONMENTAL, SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., DATED NOVEMBER 10, 1997, AND THE ADDITION OF FIELD MEASURED FEATURES, BY LOUIS FEDERICI AND ASSOCIATES 3/16/99, PRESENTED ON A DRAWING ENTITLED "KADY FIELD, TOPOGRAPHIC, SOIL SAMPLE LOCATION, AND SITE SURVEY AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT IN NEWPORT, RHODE ISLAND FOR TETRA TECH NUS, INC., LOUIS FEDERICI & ASSOCIATES, 3/16/99, DWG NO. 990205-01.

2. HORIZONTAL DATUM BASE ON THE RI STATE PLANE COORDINATE SYSTEM NAD 1927. VERTICAL DATUM BASED ON NAVEL BASE MEAN LOW WATER.

3. ALL LOCATIONS ARE TO BE CONSIDERED APPROXIMATE.

4. PLAN NOT TO BE USED FOR DESIGN.

LEGEND

- CATCH BASIN
- FENCE
- EXISTING CONTOUR
- GROUNDWATER MONITORING WELL LOCATION
- ST-2 STORM SEWER SAMPLE LOCATION (TRC, 1993)
- SW-1 STORM SEWER SAMPLE LOCATION (B&RE, 1998)
- SANITARY SEWER MANHOLE
- SANITARY SEWER
- STORM SEWER MANHOLE
- STORM SEWER MANHOLE

GRAPHIC SCALE

0' 80' 160'

1 INCH = 80 FEET

GROUNDWATER MONITORING WELL AND STORM SEWER SAMPLE LOCATIONS

OLD FIRE FIGHTING TRAINING AREA

NAVSTA NEWPORT – NEWPORT, RHODE ISLAND

FIGURE 4-4

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	J. FORRELLI	DATE:	OCTOBER 17, 2000
SCALE:	1" = 80'	FILE NO.:	DWG\5278\0531\FIG_4-4.DWG

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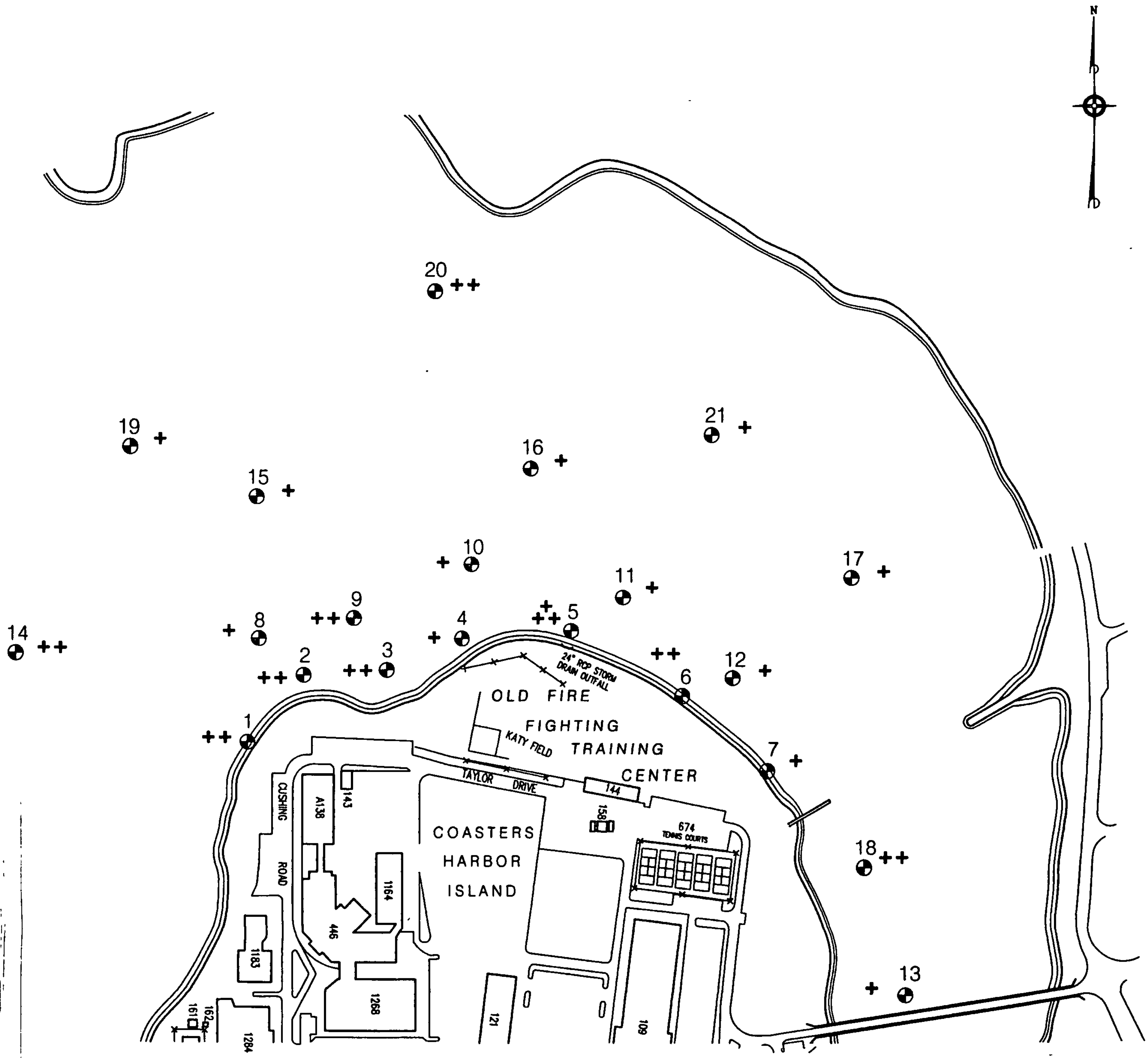


LEGEND

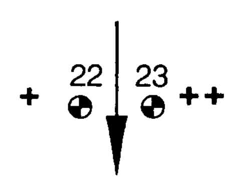
SAMPLE STATION LOCATION

RISK PROBABILITY

+ LOW

++ INTERMEDIATE

+++ HIGH



NOTES:

1. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
2. PLAN NOT TO BE USED FOR DESIGN.
3. SAMPLE STATIONS LOCATED BY GPS, DONE BY URI IN APRIL, 1998.
4. LOCATION OF SHORELINE IS APPROXIMATE MHW; SAMPLE STATIONS 1 - 7 WERE LOCATED AT ACTUAL LOW TIDE LINE AS DEFINED BY URI MARINE SCIENTISTS IN APRIL, 1998.
5. LOCATION OF 24" RCP CULVERT NEAR STATION 5 BY VISUAL INSPECTION; LOCATION TO BE CONSIDERED APPROXIMATE.

GRAPHIC SCALE

0' 300' 600'

1 INCH = 300 FEET

SOURCE: DEPT. OF THE NAVY, NAVAL FACILITIES ENGINEERING COMMAND, NAVAL STATION NEWPORT, PLAN ENTITLED: ' COASTERS HARBOR AND NAVAL HOSPITAL EXISTING CONDITIONS'

MARINE ECOLOGICAL RISK CHARACTERIZATION SUMMARY

OLD FIRE FIGHTING TRAINING AREA

NAVSTA NEWPORT – NEWPORT, RHODE ISLAND

DRAWN BY:	D.W. MACDOUGALL	REV.:	0
CHECKED BY:	R. O'NEILL	DATE:	OCTOBER 3, 2000
SCALE:	1" = 300'	FILE NO.:	DWG\5278\0531\FIG_7-1.DWG

FIGURE 7–1

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